LIMITS OF ACCEPTABLE CHANGE

BOB MARSHALL WILDERNESS COMPLEX

FISH AND WILDLIFE PLAN

Montana Department of Fish, Wildlife and Parks

In Cooperation with

the U.S. Forest Service

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EXECUTIVE SUMMARY

A task force of about 40 citizen conservationists, professional resource managers and wilderness users was convened to consider management of the Bob Marshall Wilderness Complex (BMWC). This group using a study technique known as the "Limits of Acceptable Change" (LAC), issued their report in 1987. One of the deficiencies noted in that report was lack of a fish and wildlife plan for the BMWC. This plan responds to the need to address the fish and wildlife resource of this wilderness complex and ecologically associated lands.

This fish and wildlife plan begins by addressing the philosophy of wilderness as it relates to fish and wildlife, and traces the history of the designation of the wildlands that make up this complex. After discussing the extent of the fish and wildlife resource, the plan then addresses some basic assumptions, "Foundation Issues," used by those participating in the planning process. Using the foundation issues as a basis, planning "Goals" are then set for a number of fish and wildlife species inhabiting this area. These goals are followed by "Strategies" designed to achieve the stated goal. Finally, this plan offers some indicators and standards that resource managers can use to evaluate progress in achieving and sustaining the management goals.

Implementation of the plan is proposed through a Memorandum of Understanding to be executed between the U.S. Forest Service and the Montana Department of Fish, Wildlife and Parks (MDFWP). Primary features of the Memorandum of Understanding are the creation of policy and technical committees and the appointment of a coordinator from each agency to implement the various features of the plan in the agency planning processes.

The main features of the plan are using elk distribution to determine the extent of the planning area, designation of agency coordinators to facilitate the implementation of the plan, and addressing user perceptions as an aspect of resource management.

INTRODUCTION

Background

This plan addresses three contiguous wilderness areas and ecologically associated non-wilderness land in northwestern Montana. The wilderness areas are the Bob Marshall, Great Bear and Scapegoat. All are components of the National Wilderness Preservation System, established by the Wilderness Act of 1964. These three areas cover approximately 1.5 million acres. The wildlife populations that use and depend upon this complex extend seasonally beyond the wilderness boundaries utilizing a 3 million- acre ecosystem. This total area is referred to in this plan as the Bob Marshall Wilderness Complex (BMWC) ecosystem.

The Wilderness Act requires the appropriate managing agency to manage each area, "...for such purposes for which it may have been established and also to preserve its wilderness character..." (Section 4(b)). The Act further states, "Nothing in this act shall be construed as affecting the jurisdiction or responsibilities of the several States with respect to the wildlife and fish in the national forests." (Section 4(d)(8))

The U.S. Department of Agriculture (USDA) regulations specify that in carrying out the purposes of the Wilderness Act the "...National Forest...be managed to promote, perpetuate, and ...restore the wilderness character of the land and its specific values of solitude, physical and mental challenge, scientific study, inspiration, and primitive recreation (36 CFR 293.2). To fulfill these and other requirements, the MDFWP, with the cooperation, direction and assistance of the U.S. Forest Service (USFS), has developed this fish and wildlife plan for the BMWC ecosystem.

In developing a plan for managing the wilderness areas, the USFS relied on the application of the LAC process. The LAC system provides a framework for determining the social and resource conditions acceptable in wilderness settings to ensure a diversity of quality wilderness experiences. The LAC planning process identified a number of concerns that needed to be addressed. Among those concerns was identifying goals for fish and wildlife management in the wilderness and developing a plan for achieving those goals.

Process

The LAC planning system utilized about 40 representatives of concerned citizens and user groups, USFS managers and scientists. This task force met over a 4 1/2-year period and developed an amendment to the Forest Plans directed at managing recreation in the BMWC. This amendment, issued in 1987, affected the Forest Plans of the Flathead, Helena, Lewis and Clark and Lolo National Forests.

Among the issues and concerns identified through the LAC process was the following:

> "J. Recreation-wildlife: What is the effect of recreation on wildlife, particularly threatened and endangered species, and what should be the wildlife management goal in wilderness?"

When the public commented on the LAC plan, questions continued to be raised regarding the "integration of wildlife into recreation management direction." USFS analysis of those comments noted, "A number of reviewers expressed concerns that wildlife and biological concerns had not been integrated into the draft plan." Following this analysis, the USFS decided to "...continue to cooperate with and encourage the MDFWP in developing the necessary treatment of wildlife in the recreation management direction." The MDFWP developed this plan for the fish and wildlife of the BMWC ecosystem in response to the above events and decisions.

Some of the questions and concerns expressed during the public comment period cannot be answered because the problems or concerns noted have never been evaluated. For example, the effect of recreationists on species such as grizzly bears has not been addressed in the BMWC by bear researchers. It was possible, however, to begin addressing the welfare of fish and wildlife in the BMWC ecosystem from the existing data base.

Three steps were taken in the fish and wildlife planning process that focused on the welfare and needs of the fish and wildlife utilizing this ecosystem. The first step was an inventory of the existing resource that was developed from information available. That basic inventory document, "Fish and Wildlife of the Bob Marshall Wilderness Complex and Surrounding Area" was published in January 1988 and circulated for review among the LAC task force. The second step was drafting and circulating for review another report, "Fish and Wildlife of the Bob Marshall Wilderness Complex and Surrounding Area, Planning Goals and Strategy." This report was circulated in March 1989. The third and final step in the process is the development of this plan. This plan reflects the comments received in the

review process conducted by a special committee formed from the LAC task force and the task force itself.

Scope

The scope of this fish and wildlife plan is limited in the species addressed, expansive in the geography considered, and includes historical and philosophical considerations.

Throughout the planning process, considerable concern was expressed for the fish and wildlife resources of the BMWC ecosystem. The designation of wilderness carries the clear implication that the natural systems, including all the animals dependent upon them, will be allowed to function with a minimum of interference from man. It was also clear that the public was interested in more than the game animals of the ecosystem and that emphasis should be directed to endangered species. The fish and wildlife data available, however, only supported analysis of species that had been researched or monitored for a number of years -- the game species.

The scope of this plan is limited by the information available. It is recognized that data needs to be collected on all species dependent upon the habitats available in the wilderness. The focus of this initial plan on the game species, however, is both practical and appropriate. It is practical because substantial information is available for species, such as elk and cutthroat trout. It is appropriate because the welfare of game populations and the human association with those populations is deeply rooted in the wilderness movement and in the history of the BMWC ecosystem. This assertion and these topics are addressed in the plan.

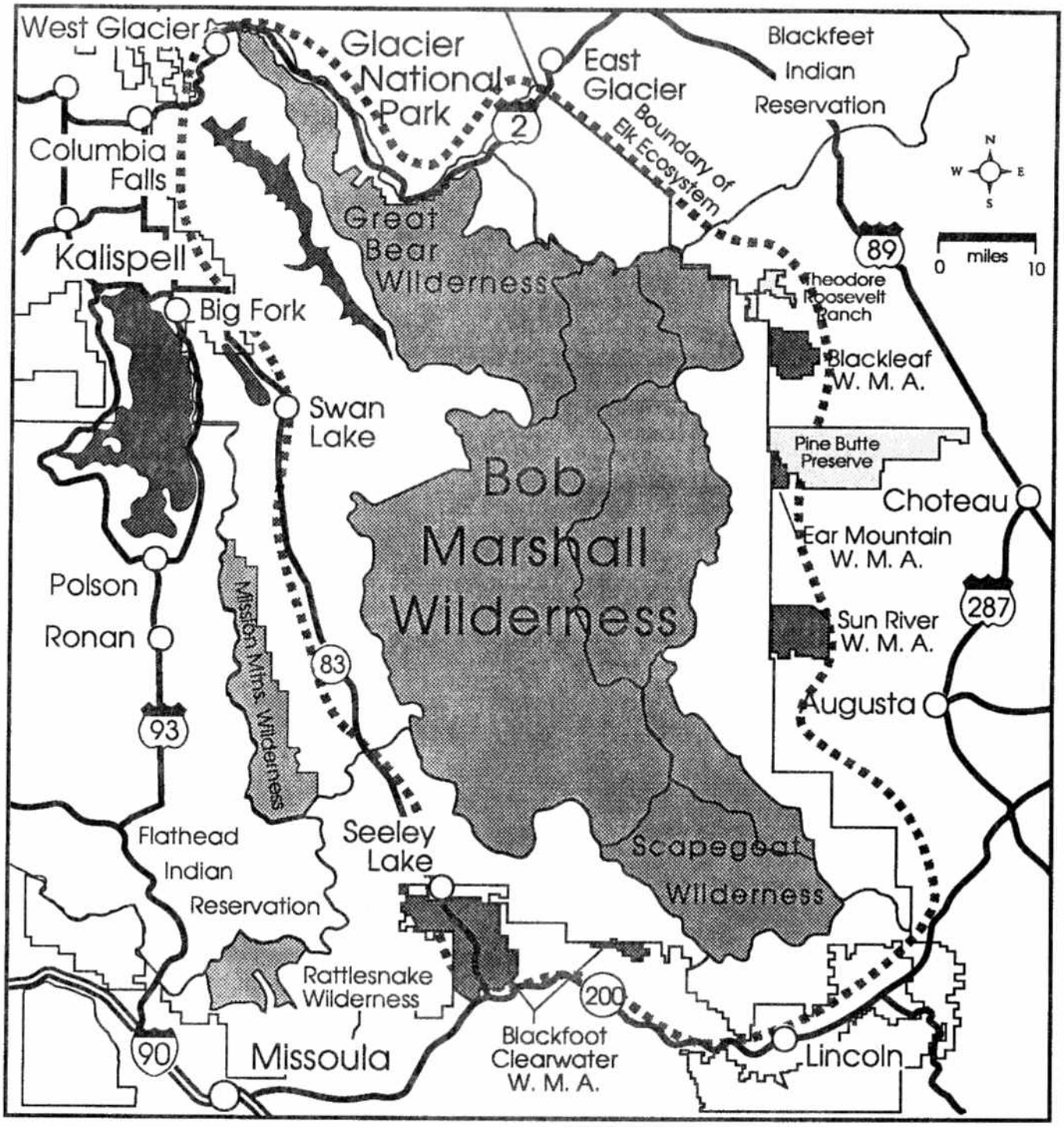
The wildlife information used in developing this plan demonstrated that the wilderness boundaries did not coincide with year-long habitat needs of many of the species being considered. The seasonal distribution of elk was used to designate the boundaries of the BMWC ecosystem for purposes of this plan (Figure 1). That perimeter generally included the terrain required by most of the species discussed in this plan. Analysis of the fish and wildlife data also demonstrated that the fish and wildlife populations using the BMWC ecosystem are, and will continue to be, products of management programs practiced both within and beyond the wilderness boundaries.

There is more to wilderness than the land and the wildlife that occupies it. The institutional protection of land and wildlife through wilderness classification is a human expression rooted in the history and philosophy of the American conservation movement. The specific tracts of land involved likewise have a

The Bob Marshall Wilderness Complex

Figure 1.

Montana Department of Fish, Wildlife & Parks



conservation history of their own. Understanding these human aspects of resource allocation and management is important. Wilderness users and managers need to know why these wilderness areas, and the associated fish and wildlife resources, exist. It is likewise important to be aware of what the expectations were of those who contributed to the conservation of these resources. These historical and philosophical considerations are used to introduce this planning process.

Order of Presentation

The plan will begin with a discussion of some historical events and philosophical considerations related to wilderness, wildlife and our human association with these resources. These reflections will address some of the ideas leading to the creation of the wilderness system and some of the events associated specifically with the BMWC ecosystem.

Following the historical/philosophical background, the extent of the fish and wildlife resource utilizing this area will be discussed. This discussion, of necessity, is focused on game species. It is again reiterated that this does not demean the importance of the other species of wildlife dependent upon this area.

After the inventory is presented, some basic principles that will direct the plan will be presented. These principles are referred to as "foundation issues" and they form the basis for developing the fish and wildlife goals. Specific planning goals for the fish and wildlife are then presented along with strategies for achieving those goals.

Implementation of the plan will be dependent on a Memorandum of Understanding developed by the USFS and the MDFWP. That memorandum should acknowledge the appropriate wilderness management concepts and create an implementation committee staffed by the two management agencies. The plan includes identification of indicators and standards as guidance for the implementation committee.

This work was essentially drafted by biologists of the Montana Department of Fish, Wildlife and Parks. The historical and philosophical section was written by Jim Posewitz; the wildlife sections were drafted primarily by Gayle Joslin and Shawn Riley; and the fisheries sections by John Fraley. All of the authors are grateful to the LAC task force, other MDFWP biologists and USFS participants for their valuable assistance.

HISTORICAL AND PHILOSOPHICAL PERSPECTIVE

Wilderness conservation and wildlife protection have shared the time and attention of America's conservationists throughout our history. This discourse will recognize representative parts of the history of the land under consideration along with development of the philosophy that led to its current condition.

This background is valuable in assessing the wilderness and wildlife legacy entrusted to us. Likewise, it is important that we contribute what we are able to secure and enhance this heritage. In 1836, Ralph Waldo Emerson began his essay "Nature" with these sentences: "Our age is retrospective. It builds the sepulchers of the fathers." He concludes the same paragraph by counseling, "The sun shines today also. ...There are new lands, new men, new thoughts. Let us demand our own works and laws and worship." (Cook 1950) Thus, we have an admonition, from one of our nation's first conservationists, to respect our origin and a license to express our contemporary vision. This fish and wildlife plan pursues that noble purpose.

AN EVOLVING WILDLAND PHILOSOPHY

To develop a background for a wilderness and wildlife management philosophy, the writings of three individuals were reviewed. These people, Theodore Roosevelt (1858-1919), Bob Marshall (1901-1939), and Aldo Leopold (1887-1948) were prominent in laying the groundwork for the American wilderness system. None of them lived to see passage of the Wilderness Act. Each of them brought a different perspective to the issue reflecting their own sensitivities and passions. Collectively their philosophies endow our wilderness heritage and enhance our understanding of why the institution of wilderness now attends our culture. That understanding will help us plan the future of the Bob Marshall Wilderness Complex.

Theodore Roosevelt was a hunter and an advocate for preserving wilderness, wildlife, and the hunt. In an article he authored in 1905, he wrote, "A peculiar charm in the chase of the wapiti, comes from the wild beauty of the country in which it dwells." Further in the article he continues, "All really wild scenery is attractive. The true hunter, the true lover of the wilderness, loves all parts of the wilderness, just as the true lover of nature loves all seasons." (Schullery 1986) One of Roosevelt's many conservation legacies was the Forest Reserve System from which many of our wilderness areas were or are being derived. To him the wilderness was the still uncharted lands. When he was born buffalo hides from Montana's Rocky Mountain Front were being sent down the Missouri River by the tens of thousands each year. When he died the American conservation movement was firmly committed to public land preservation and wildlife restoration.

Theodore Roosevelt was one of the first Americans with political clout who also saw value in preserving our nation's wildness. His vision came home through the eyes of a sport hunter. To Roosevelt, big game hunting, particularly elk hunting, and wild country were synonymous. In 1893, he wrote:

> "Hunting in the wilderness is of all pastimes the most attractive, and it is doubly so when not carried on merely as a pastime. Shooting over a private game preserve is of course in no way to be compared to it. The wilderness hunter must not only show skill in the use of the rifle and address in finding and approaching game, but he must also show the qualities of hardihood, self-reliance, and resolution needed for effectively grappling with his wild surroundings." (Op. Cit.)

If one can look beyond Theodore Roosevelt's somewhat exaggerated perception of what was considered manhood at the turn of the century other important concepts are articulated. One of these concepts is that conservation of wildlife and wild country are the same issue. The other is that these resources are for all people. In a 1905 writing, he reveals his thoughts as follows:

> "Every believer in manliness and therefore in manly sport, and every lover of nature, every man who appreciates the majesty and beauty of the wilderness and of wild life, should strike hands with the farsighted men who wish to preserve our material resources, in the effort to keep our forests and our game beasts, game-birds, and game-fish -- indeed, all the living creatures of prairie and woodland and seashore -- from wanton destruction.
>
> Above all, we should realize that the effort toward this end is essentially a democratic movement. It is entirely in our power as a nation to preserve large tracts of wilderness, which are valueless for agricultural purposes and unfit for settlement, as playgrounds for rich and poor alike, and to preserve the game so that it shall continue to exist for the benefit of all lovers of nature, and to give reasonable opportunities for the exercise of the skill of the hunter, whether he is or is not a man of means." (Op. Cit.)

Although we were still more than a half a century away from passage of the Wilderness Act, American conservationists were laying the foundation. This foundation, clearly shows a relationship between preserving wild lands and sustaining wildlife for the hunter. It also shows the significance of the hunter in developing not only the philosophy of wilderness preservation but in Roosevelt's case the conversion of those ideas into action. Roosevelt's conservation legacy as president is legend. When he ascended to the presidency there were 40 million acres of National Forest lands, when he left there were 194 million acres. In essence, much of the rough material from which the wilderness system would be fashioned was being set aside in public ownership. It would take time and thoughtful debate to eventually formalize the institution of a congressionally classified Wilderness System.

The generation between Roosevelt's land reserving and a wilderness system produced at least two thoughtful advocates that concentrated on the issue, Bob Marshall and Aldo Leopold. Both men saw land they were responsible for being divided by roads and subjected to mechanized use. In response they conceived the notion that some lands must remain unaffected, protected from the impacts of this kind of use.

Bob Marshall's life and career attended the evolution of the wilderness concept and saw wilderness become a reality under United State's Forest Service regulation. Marshall's attention seemed most focused on the aesthetic aspects and physical challenge of wilderness. Wildlife and it's pursuit were rarely the center of his attention. To Marshall, wilderness was a big, wild, challenging place and he responded by constantly testing himself against wild country. At the same time his esthetic sensitivities were never diminished no matter how arduous his adventure. In this physical relationship to wilderness, Marshall shared some of Theodore Roosevelt's sense of exhilaration. Unlike Roosevelt, Marshall had no passion for the hunt, his attention focused other values. Writing, in 1928, in defense of wilderness as a minority right, he stated:

> "A small share of the American people have an overpowering longing to retire periodically from the encompassing clutch of a mechanistic civilization. To them the enjoyment of solitude, complete independence, and the beauty of undefiled panoramas is absolutely essential to happiness. In the wilderness they enjoy the most worthwhile or perhaps the only worthwhile part of life." (Glover 1987)

Marshall often argued for wilderness because of it's physical dimension and the esthetics that often attended that physical testing. In 1930, he wrote:

> "Life without such exertions would be for many persons a dreary game, scarcely bearable in it's horrible banality."

In the same article he added:

> "But when one looks at and listens to the wilderness he is encompassed by his experience of beauty, live's in the midst of his aesthetic universe." (Op. Cit.)

Bob Marshall's contributions to wild land preservation are legend. His focus and energy sought to emphasize and revel in the physical and esthetic experience. In many respects he added balance to evolving wilderness thought by keeping the purely aesthetic experience well represented among the cadre of activists actually developing the wilderness system within the U.S. Forest Service.

Among that cadre was an articulate wilderness advocate whose arguments for conservation of country, wildlife and a sensitive human relationship with both became gospel that persists to this day -- Aldo Leopold. More than any other thinker Leopold honed the wilderness and wildlife relationship to an edge keen enough to carve through complexities perhaps unheard of in his time. His credentials as a scientist, manager, teacher and citizen

activist are impeccable. He was a founder of the Wilderness Society, a forester, author of the classic textbook "Game Management" and philosopher whose essays on conservation, esthetics, and management remain classics of our culture. His writings present ideas and concepts that can be relied upon for contemporary guidance. His many articles and essays also record the fact that wild land conservation and wildlife conservation were carried by a common ancestry.

Writing in American Forests and Forest Life, the magazine of the American Forestry Association, in October of 1925, Leopold stated:

> "Wild places are the rock-bottom foundations of a good many different kinds of outdoor play, including pack and canoe trips in which hunting, fishing, or just exploring may furnish the flavoring matter." (Leopold 1925)

In this statement we see the close association between the seeds of the wilderness movement and hunting and fishing. The association is drawn by one of the founding fathers of the wilderness movement who also is creditably identified as the father of wildlife management. This idea then was germinating 39 years before there would be a Wilderness Act. Articulation of this concept and association recurs frequently in Leopold's writings.

The record of grassroots public advocacy for wilderness in the early 1900s is difficult to find. One such reference, however, appears in an essay addressing "Origin and Ideals of Wilderness Areas". The article appeared in the official publication of The Wilderness Society in July of 1940. The article attempted to trace the wilderness movement prior to 1926. In that article the author states:

> "The earliest action I can find in my files is a letter dated September 21, 1922, notifying the District Forester that two local Game Protective Associations had endorsed the establishment of a wilderness area on the head of the Gila River, in the Gila National Forest." (Leopold 1940)

Game protective associations were the rod and gun clubs or sportsmen's associations of that era. The important point is that wilderness advocacy was a part of the wildlife conservation advocacy of grassroots sportsmen as well as philosophical leaders the stature of Leopold.

A distinction that must eventually be addressed is whether contemporary wilderness management programs are to focus on production of harvestable game or on some other aspects of

recreation such as certain perceptions of hunting quality. In addressing a difference of opinion held between the Ecological Society and the Wilderness Society, in 1942, Aldo Leopold said:

> "Serious ecological studies of a professional nature are...important, and they...have a place in wilderness areas. The fallacy lies in the assumption that all ecology must be professional, and that wilderness sports and wilderness perception are two things rather than one. Good professional research in wilderness ecology is destined to become more and more a matter of perception; good wilderness sports are destined to converge on the same point. A sportsman is one who has the propensity for perception in his bones. Trigger-itch, wanderlust, and buck-fever are simply the general raw materials out of which perception is built." (Leopold 1942)

This particular passage addresses a number of points and, interestingly, carries an endorsement for the current process being employed to develop wilderness management plans. Specifically, that endorsement is that ecological contemplations and wildlife management planning is as much the domain of the perceptive sportsman as it is the professional manager. The same fundamental point appears in more contemporary writing when authors Schoenfeld and Hendee point out:

> "The flavor of wilderness-wildlife management...depends on the strength of the wilderness ethic among wilderness-wildlife managers and their constituencies." (Schoenfeld and Hendee 1978)

<u>It therefore follows that one of the first steps planning must take is to identify a common perception regarding how we will relate to wilderness fish and wildlife as managers, as sportsmen, and as other users of this resource.</u>

Leopold, as always, can be relied upon for some degree of guidance. In his essay "Conservation Esthetic" he stated:

> "To promote perception is the only truly creative part of recreational engineering." (Leopold 1966)

One of our other mentors, Theodore Roosevelt, displayed the desire for a more direct involvement when he wrote:

> "Hunting in the wilderness is of all pastimes the most attractive, and it is doubly so when not carried on merely as a pastime."

In a later article Roosevelt argued:

> "It is...in our power...to preserve large tracts of wilderness...to preserve the game so that it shall continue to exist for the benefit of all lovers of nature, and to give reasonable opportunities for the exercise of the skill of the hunter, whether he is or is not a man of means." (Schullery 1986)

The thoughts of these two conservation pioneers suggest that hunting, and conservation to support a particular kind of hunting, are a reason for wilderness. They also suggest we must give attention to building sensitive perceptions into how recreationists relate to that activity. Traditionally resource managers avoid this type of "social engineering." Perhaps a process, such as LAC wilderness planning, involving both professional managers and Leopold's sportsmen, with a "propensity for perception in his bones", can cross that threshold.

Resource planning efforts that begin with consideration of the origins of the ideas that produced the wilderness concept, need also to consider how specific areas were added to the system. In doing this we declare a respect for both, the national and the local energy expended in conserving wildlife and protecting wildlands.

CLASSIFICATION OF THE LAND

On the 17th of May, 1933, Bob Marshall wrote to the Regional Forester Meyer Wolff in Missoula:

> "I do wish that you would hurry up and get that entire country from the Locksaw River to the southern border of Region One set aside as wilderness before some damn fool chamber of commerce or some nonsensical organizer of unemployed demands a useless highway to provide work and a market for hotdogs and gasoline." (Glover 1987)

Bob Marshall failed to inspire forester Wolff. The U.S. Forest Service at that time already had regulations that allowed setting aside "primitive" areas. These rules, the "L" regulations and later a new classification, the "U" regulations, were used to begin assembling the Bob Marshall Complex. The upper Sun River, the Pentagon area, and the upper South Fork of the Flathead River, were protected by this classification. Bob Marshall died in 1939 and a year later these three primitive areas were combined into a wilderness and named the Bob Marshall Wilderness in his honor (Graetz 1985).

The land to the north and south of these protected areas remained quietly under U.S. Forest Service custodial care until 1968. In that year, a plan for development of the Lincoln-Scapegoat was issued. The plan, entitled "The Blackfoot - Sun River Divide Area, Management for People" called for a Continental Divide crossing, logging roads, logging 25 percent of the area, campgrounds and winter recreation vehicle use of the area. The result was a controversy that spanned a four-year period and resulted in the creation of the Scapegoat Wilderness in 1972. (Op.Cit.)

There were many important lessons and points of relevance that need to be remembered in the Lincoln-Scapegoat debate. Review of the testimony offered in congressional hearings on this area shows that preservation of fish and wildlife values was a recurring theme among the advocates for protection. Also evident in this debate was the coalition of sportsmen and outfitters that worked for including this area in the wilderness preservation system. (Op. Cit.)

U.S. Forest Service historian Dennis M. Roth identifies the Lincoln-Scapegoat legislation as:

"...the first strictly citizen wilderness proposal made after the passage of the Wilderness Act."

Historian Roth's analysis was further qualified with the recognition that this issue stirred considerable debate within the U.S. Forest Service and that:

"Without the dissenting voices of Bob Morgan (Helena Forest Supervisor) and the Lincoln District Rangers...roads would have been built...before the Scapegoat Wilderness Act of 1972." (Roth 1984)

If any two people could be singled out as citizen leaders in the advocacy for the Lincoln-Scapegoat, they are Cecil Garland and Tom Edwards. Garland, a Lincoln merchant, spoke often and eloquently for a country he loved. His feelings are portrayed by a portion of his testimony before a congressional hearing on September 23, 1968:

"Senator Burdick, Senator Metcalf, and ladies and gentlemen: Fifteen years ago, when I first brought my family to the community of Lincoln, I was told of a great wild country to the north known as the Back Country. They told me with awe in their voices of places called Ringeye, Scotty Creek, Lost Pony, Red Mountain, the East Fork, the North Fork, Parker Lake, Meadow Lake, the Twin Lakes and an almost unworldly country called Scapegoat and Half Moon Park.

"I longed to see that country, to know its wild beauty, to catch its fish, to hunt its game, and to climb its mountains.

"Unusually wonderful, it was then, when the time came to pack our camp and move away from roads that led back to that world we call civilization.

"We camped that first night on a small bench above Ringeye Falls. Taking down our tent from an old frame that the pack rats were using for a home, we made a secure camp, cooked our supper, fed our stock, and then turned our complete thoughts to our whereabouts.

"We took from our duffle an old reed elk bugle and as the chill air fell with the sun we shattered the calm of that September evening with a blast from our elk call. Then almost as by magic, above us on Red Mountain a bull elk bugled his challenge that this was his home. All through the frosty fall air the calls echoed back and forth and I knew that I had found wilderness.

"I would not sleep that night for I was trying to convince myself that this was really so; that there was wild country like this left and that somehow I had found it. But all was not at peace in my heart for I knew that someday, for some unknown reason, man would try to destroy this country, as man had altered and destroyed before.

"That night I made a vow, that whatever the cost for whatever the reason, I would do all that I could to keep this country as wild as I had found it."

Tom Edwards, at the same hearing, put it this way:

"I am Tom Edwards, of Ovando, Montana. I have owned and operated the Whitetail Ranch continuously since 1937. My sole income comes from outfitting into the Lincoln-Scapegoat back country and the Bob Marshall Wilderness areas. For over a quarter of a century I have virtually lived in these areas, especially the Lincoln-Scapegoat back country, from Decoration Day to Thanksgiving. I have been privileged to take guests from all over the United States and some from foreign lands into every crook and cranny of this marvelous wilderness. I love the high country and alpine meadows with a passion - it restores my soul and into this land of spiritual strength I have been privileged to guide over the years literally thousands of people, the old, many past 70, the young, the poor, the rich, the great, and small people like myself. I have harvested a resource of the forest of most importance. No one word will suffice but to explain this resource let us call it the 'hush' of the land."

The list of witnesses at that hearing was long. Significantly, it included outfitters, hunters, and a variety of wildland advocates supporting one another in the cause of wilderness classification for the Lincoln-Scapegoat area.

The next addition to the Bob Marshall Complex was the Great Bear Wilderness. The local rod and gun club of Kalispell initially petitioned the U.S. Forest Service in the mid-1950s asking that the area be added to the Bob Marshall Wilderness. The request was turned down (Graetz 1985). What is particularly interesting is the parallel between this act and the one taken by a sportsmen's club in 1922 to save the headwaters of the Gila River as reported by Leopold (Leopold 1940). The thread of sportsmen supporting wild land for wildlife purposes runs consistently through the history of Wilderness.

On March 12, 1977, a group that dubbed itself "The Citizen's for the Great Bear Wilderness" met at Trixie's Saloon at Ovando,

Montana. Like the Lincoln-Scapegoat advocates, the group was richly endowed with hunters, outfitters and people dedicated to wild land protection. Wilderness classification was achieved in 1978 (Op. Cit.).

The effort to continue classifying additional lands as wilderness all along the perimeter of the currently classified areas continues. In addition to the lands identified by our human institutions, as country needing protection, there is at least one other perspective that must be drawn. The wildlife of this complex has a selection process of it's own. It is a process attended by ecological necessities and territorial imperatives. These biological realities are just as important and significant as our human selections and designations. Just as the history of our philosophical and political efforts is important, so is the history of wildlife's presence important.

THE HISTORY OF WILDLIFE

The Lewis and Clark Expedition of 1804-1806 provided an excellent picture of wildlife abundance along their routes of travel. During their journey to the Pacific, the expedition passed to the east of what would become the Bob Marshall Complex. On the return journey, Capt. Lewis came closer and actually passed through a corner of the complex when he ascended the Big Blackfoot River and crossed the Continental Divide at the head of Alice Creek. The pass, presently named Lewis and Clark Pass, commemorates this crossing. The expedition's commentary made approaching, and following, this crossing raises several important considerations. These considerations are the scarcity of game they experienced in the region's mountainous areas and the abundance of game they found on the northern plains and along the Missouri.

On July 7, 1806, Captain Clark crossed from the Columbia drainage into the Missouri. The next day his journal reported:

> "...we...proceeded due north, through an open plain, till we reached Shishequaw Creek (now Elk Creek)...here we halted and dined and now felt, by the luxury of our food, that we were approaching the plains of the Missouri, so rich in game."

Three days later along the Sun River they recorded they had seen elk:

> "...but in this neighborhood the buffaloe are in such numbers, that on a moderate computation, there could not have been fewer than ten thousand within a circuit of two miles. At this season, they are bellowing in every direction, so as to form an almost continued roar, which at first alarmed our horses, who being from the west of the mountains, are unused to the noise..."

The summary of the chapter of the journal immediately preceding the one containing the above entry consisted of a general description of travel in the western mountains. This summary included the following passages:

> "...the party set out, and arrived at <u>Hungry Creek</u> - the serious and desponding difficulties that obstructed their progress...their distress for <u>want of provisions</u> ...the danger of the route described, their <u>scarcity of provision</u> (Hana 1961) (emphasis added).

The point being suggested by the above is that in pristine Montana it was the fertile plains that held the abundance of game rather than the mountainous enclaves that later became synonymous with the opportunity to find big game.

By the 1850s, commercial traffic in buffalo parts had reached the Rocky Mountain Front. In 1857, 36,000 robes were shipped down the Missouri from Fort Benton. In 1876, the year Custer died on the Little Big Horn, 80,000 robes went down the Missouri, it was Fort Benton's peak year. By 1884, the hide trade declined to zero and the country was left to the bone pickers and an economy of domestic livestock (Picton and Picton 1975).

What was going on in the mountains to the west left little record for posterity. Augusta and Choteau were growing in the 1880s and lumber for that growth was coming from a sawmill in Sun River Canyon. By 1885, area residents considered the game herds to be remnants. The Great Falls Tribune reported on March 26, 1887, that local "Nimrods and fishermen discussed the formation of a sportsman club..." (Op. Cit.) At least one hunter still found the Rockies attractive. In an article entitled "The Wapiti or Round-Horned Elk," published in 1905, Theodore Roosevelt reported:

> "In the early nineties it was still abundant as ever in large regions in western Wyoming and Montana and northwestern Colorado. In western Montana they are scattered over a wider region and are protected by the denser timber, but are nowhere plentiful." (Schullery 1986)

Events also began to take place that announced the beginning of a new era for wildlife. In 1897, the mountainous area became a Forest Reserve. In 1905, the U.S. Forest Service was created and took over its management. Results, however, were slow to materialize. Elers Koch, an early ranger, reported in 1905 that in a month's trip through the Blackfoot, Swan, South Fork of the Flathead, Sun and Teton river country they saw no big game (Graetz 1985). Ranger Clyde P. Fickes noted, "In May 1908, I counted and estimated that 500-600 elk wintered on the West Fork (Sun River) licks and vicinity. That was about all the elk in the area at that time." (Op. Cit.)

The record of fish and wildlife trends in the mountainous country that today comprises the Bob Marshall Complex is at best poor. The impressions we gain from the bits and pieces we have suggests that if the country ever was rich in game it was badly depleted at the turn of the century. The early 1900s saw not only a reversal of that trend but perhaps the development of a new order in which wildlife recovery and survival was dominated and influenced by human institutions and actions. Predator

control was one of those actions and bounties on wolves ranged up to $75 (Picton and Picton 1975). In time, bounties, government hunters and poisons combined to extirpate wolves.

In 1913, the Montana legislature created the Sun River Game Preserve between the north and south forks of the Sun River and the continental divide. This preserve, a growing list of hunting regulations, wild fires and improved public land management practices all contributed to an improving circumstance for wildlife. Elk were responsive and their population growth received considerable public attention. By 1916, there were a reported 1,479 elk in the Sun River herd and, by 1917, the reported number grew to 1,708 (Op. Cit.). A summary of the early elk population response in the Sun River country contained the following information:

> "The first quarter of the 20th century saw the elk herd grow from a relatively small herd to a population threatening its own habitat as well as cattle grazing in the upper Sun River. The increased population and improved transportation brought an open conflict between individuals pursuing their separate ideals of wilderness America and the cattle industry. Because the newly created Office of the State Game Warden was still weak and politically unstable, the U.S. Forest Service took the brunt of the problems. The closing years of the period saw an increasing involvement of professionally trained foresters in the management of the area. These professionals consistently recommended the abolition or modification of the Game Preserve." (Op. Cit.)

The problems of wilderness wildlife now took on a new focus. Settlement had domesticated the critical foothill winter ranges while wildlife protection had accommodated a rapid recovery of big game. Overgrazing of critical winter ranges was a real problem. Sun River Canyon where elk and bighorn sheep shared the available forage was among the affected areas. The winter of 1927-28 was particularly bad and in that winter a die-off of bighorn sheep was reported. That same winter 2,261 elk were counted wintering on private lands outside the mountains (Op. Cit.). The problems of accommodating the growth of migratory game populations that seasonally rely on the wilderness were to persist for decades.

In 1934, two men met on Cabin Creek tributary to the Sun River's North Fork to discuss the problems of elk and land use. The men talked of both the need for wilderness and the need for winter ranges to secure the elk and other game populations of this wild country. The men were Bob Cooney, working at that time for the U.S. Forest Service, and Olaus Murie of the U.S. Fish and Wildlife Service (Graetz 1985). In 1940, Cooney became the first

big game manager for the Montana Department of Fish and Game. In that position, he was instrumental in the eventual acquisition of the Sun River Game Range. Of particular significance, Murie became one of the founding fathers of the Wilderness Society and when the Montana Wilderness Association was formed in 1958, Bob Cooney sat on its first governing council.

The problems of wildlife were not easily solved. Winter losses of bighorn sheep were reported in 1932 and again in 1936. Winter losses of elk were reported for the Sun River in 1935 and were reported as severe in the south fork of the Flathead from 1933-37. These annual losses were estimated at from 1,575 to 2,275 in the South Fork (Picton and Picton 1975). In 1937, Bob Marshall was called to Montana to consider flying hunters into the South Fork primitive area to encourage a reduction of elk numbers. Stimulus for this action was the fact that, "after one especially hard winter, five hundred elk carcasses had been found in a ten-mile strip along the South Fork." (Glover 1987) On the Rocky Mountain Front, the Fish and Game Department hired "elk herders" to drive elk off private property and hold them in the mountains.

In 1943, concerned sportsmen and ranchers formed the Sun River Conservation Council to assist in finding a solution. With substantial assistance from this council, the Sun River Game Range was acquired, a property holding that eventually grew to nearly 20,000 acres of state owned and leased land. Today, the state has since acquired the Blackfoot-Clearwater, Ear Mountain, and Blackleaf management areas which support wilderness wildlife. Private conservation organizations are now also contributing with the Nature Conservancy having acquired the Pine Butte swamp property and the Boone and Crockett Club the Triple Divide Ranch. The Boone and Crockett acquisition was made to celebrate their first century of conservation activity and the ranch is now named in honor of their founding father, Theodore Roosevelt.

Evaluation of the effectiveness of the Sun River Game Range is of importance. In the first winter, 36 percent of the elk inventoried were counted on the new range. Three years later, 79 percent of the elk were found there. The elk herd census that year provided one of the highest counts on record (Picton and Picton 1975). What became evident was that wildlife, how they used the country, and their levels of abundance, all were responsive to manipulations man exercised on their behalf. Of equal significance is the emerging realization that the wilderness wildlife are dependent on ecosystem components beyond the designated boundaries. Of final importance emerges the fact that the investment necessary for wildlife recovery largely came from sportsmen.

Enormous strides have been made to create a wildland philosophy, convert that philosophy into the creation of a

wilderness system and fashion a wildlife recovery of substance. Allocation of the use of that resource is probably the most difficult aspect of resource management. Consensus on restoring wildlife and providing once unavailable components of their ecosystem took almost a half century to accomplish. The process continues, now into what will soon be a century of conservation effort. Achieving equity in its use, and including the fish and wildlife populations in the search for that equity, will be more challenging.

ALLOCATION OF RESOURCES

Recent trends in hunting seasons, hunter numbers, and elk harvest are addressed in the wildlife section of this report. The question of resource allocation is addressed here to present background information based on the writings of Leopold and Roosevelt. What is being established is that the issue of allocating wild land resources was a subject addressed early in the evolution of the conservation movement.

The allocation of wildlife or the opportunity to pursue wildlife has enjoyed a peaceful tradition. For the most part, anyone who wanted to hunt or fish simply did so. The need to limit use, for conservation purposes was initially handled by restricting use uniformly. Either sex elk seasons were shortened and all users conformed. When permits for cow elk became necessary a drawing seemed to satisfy the basic public desire for equal treatment. For the outfitters restrictions on use followed a different pattern. For them use problems were addressed by limiting the number of outfitters allowed to operate on some of the public lands, and in time the number of client use days they could utilize.

For the rank and file hunter and fisherman restriction became a growing part of recreation. Gear restrictions, access restrictions, season limitations, catch and release fishing and other changes became facts of life. In a major move the state legislature established a limit of 17,000 on nonresident hunters buying the combination license that included the elk license. This was done in 1976. That limitation produced no particular concern until the demand for those licenses escalated. When that demand reached competitive proportions, in the mid-1980s, a specific number was allocated to hunters utilizing the service of outfitters.

The nonresident "set aside" was first done administratively and in 1987 the Montana legislature adopted and somewhat expanded on the concept. This action probably combined with a growing body of other restrictions attracted considerable public attention and stimulated some controversy. If this wildlife planning process eventually leads to addressing the allocation of available hunting opportunity, background on the question of equitable opportunity is important.

Repeating what Theodore Roosevelt counseled is again of value:

> "...Above all, we should realize that the effort toward this end is essentially a democratic movement. It is entirely in our power as a nation to preserve large tracts of wilderness, ...as playgrounds for rich and poor alike, and to preserve the game so that it shall continue to exist for the benefit of all lovers of nature, and to give reasonable opportunities for the exercise of the skill of the hunter, whether he is or is not a man of means." (Schullery 1986)

Roosevelt went on to say:

> "It is foolish to regard proper game-laws as undemocratic, unrepublican. On the contrary, they are essentially in the interests of the people as a whole, because it is only through their enactment and enforcement that the people as a whole can preserve the game and can prevent its becoming purely the property of the rich, who are able to create and maintain extensive private preserves." (Op. Cit.)

On still another occasion Roosevelt offered:

> "The movement for the conservation of wildlife, and the larger movement for the conservation of all our natural resources, are essentially democratic in spirit, purpose and method." (Op. Cit.)

Both Bob Marshall and Aldo Leopold saw wilderness allocation as protection of a minority right. Both seemed sensitive to even the suggestion that wilderness could ever be an undemocratic allocation. At one time Marshall argued that it was a wilderness lover who wrote that people are:

> "...endowed by their creator with the inalienable rights...to life, liberty and the pursuit of happiness..." Marshall added, "the full enjoyment of these rights is possible only in the wilderness..." (Glover 1987)

That statement certainly was true for Marshall.

Leopold responded to the idea that wilderness may not be democratic because it is in a way limiting the range of uses. He wrote:

> "There are those who decry wilderness sports as 'undemocratic' because the recreational carrying capacity of a wilderness is small, as compared with a golf links or a tourist camp. The basic error in such argument is that it applies the philosophy of mass

> production to what is intended to counteract mass production. The value of recreation is not a matter of ciphers. Recreation is valuable in proportion to the intensity of its experiences, and to the degree to which it differs from and contrasts with workaday life. By these criteria, mechanized outings are at best a milk and water affair." (Leopold 1966)

In many respects, today's question of allocation of wilderness opportunity is a new problem. The origin of this problem lies in the intersection of rising demand, limited area, and fish and wildlife resources of growing economic proportion. In some respects, this problem is the step-child of our success. Resolving the question of equitable opportunity is clearly one of our most challenging horizons.

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CONTEMPORARY WILDLIFE SUMMARY

Today, the Bob Marshall Wilderness Complex (BMWC) ecosystem is important to many species of wildlife and provides exceptional outdoor recreational opportunities. Although many areas of the state have been developed over the years, the BMWC ecosystem has maintained a back-country tradition where hunting has remained relatively unchanged and the recreational values offered are not only exceptional in Montana, but rare in the entire country. Important big game populations occur in the ecosystem, but elk hunting has historically provided the majority of recreational opportunity. In order to maintain traditional wildlife values, attention must focus on activities and management within statutory wilderness and upon other areas essential to the welfare of wilderness wildlife populations.

Elk were selected as a key wildlife species because there is an information base available and because they attract the majority of wilderness users for at least three months of the year, primarily the fall hunting season. The land area addressed in this report is defined as the BMWC elk ecosystem, or that area in and around the wilderness complex which is used by approximately 11,000 elk.

Elements covered in developing this wildlife plan include current elk distribution and population levels, land ownership, past elk management practices and trends in harvest, land management throughout the ecosystem and on winter ranges, and brief reviews of other big game species within the elk ecosystem. Information relative to waterfowl, upland game, nongame, and furbearers is recognized as an important part of wilderness management. This information is presented in detail later in this plan. Unfortunately, there is not enough specific information to begin addressing all the species that depend upon this wilderness environment. That unfortunate reality in no way demeans the presence, nor diminishes the importance, of other game and non-game wildlife found in the BMWC.

A broader perspective of wildlife habitat and security needs throughout the BMWC ecosystem is essential to maintaining wildlife recreational opportunities within the wilderness. Likewise, management of statutory wilderness alone will not sustain wildlife populations. Many wildlife values of the wilderness are contingent upon lands surrounding the wilderness complex. Management of these lands, particularly the public lands, will determine the future status of BMWC wildlife. Numerous opportunities do exist to assure wildlife values through

sensitive land management practices on adjacent non-wilderness lands.

Study Area

The study area (Figure 1) was defined on the basis of elk distribution. Elk within this area range from Glacier National Park (GNP) on the north to the Blackfoot-Clearwater valley on the south, and from the Swan Valley on the west to the foothills of the Rocky Mountain Front on the east. The heart and bulk of this vast elk range is the Bob Marshall, the Great Bear, and the Scapegoat wilderness areas. For purposes of this discussion, it is called the BMWC elk ecosystem. It encompasses 3,923,448 acres.

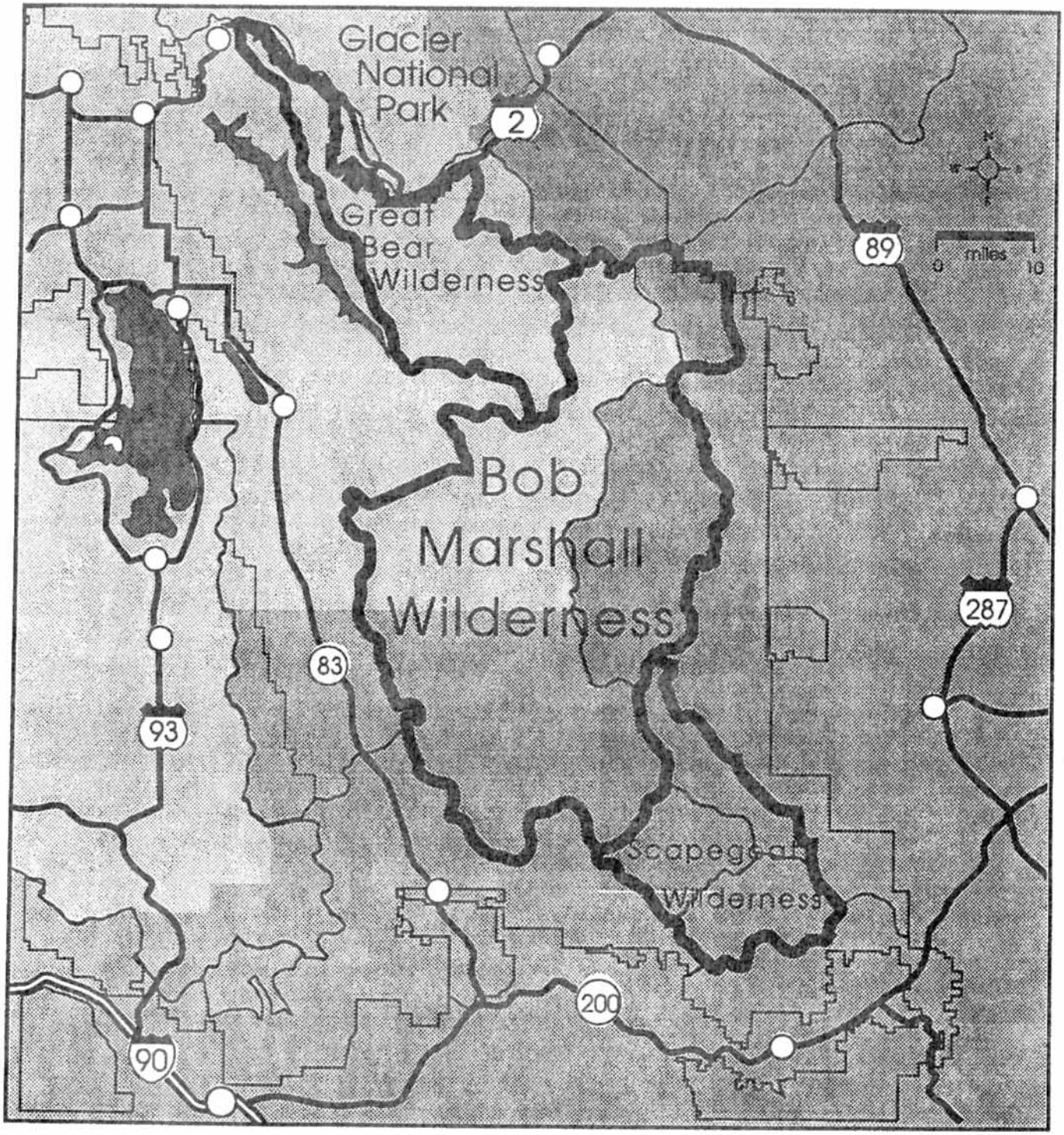
Wildlife management in the BMWC ecosystem attempts to balance animal needs with climate, physiography, land management, and recreational demands. The MDFWP manages the ecosystem's wildlife through three administrative regions: the Flathead and Swan drainages occur in Region 1, the Blackfoot and Clearwater drainages occur in Region 2, and the Two Medicine, Badger, Birch, Teton, Sun, and Dearborn drainages occur in Region 4 (Figure 2). The term "Region" is used in this report when referring to this administrative arrangement.

Portions of four national forests occur in the BMWC (Figure 3). They roughly parallel the MDFWP regions as follows: the Flathead National Forest (FNF) is in MDFWP Region 1. The Lolo National Forest (LNF) segment occurs in MDFWP Region 2, as well as a portion of the Helena National Forest (HNF). East of the Continental Divide, the Lewis and Clark National Forest (L&CNF) coincides with MDFWP Region 4. Forest plans will bear directly upon the future of elk and other wildlife within the ecosystem.

Administrative Regions

Figure 2.

Montana Department of Fish, Wildlife & Parks



Region 1 **Region 2** **Region 4**

CONTEMPORARY FISHERIES SUMMARY

The fisheries resource within the Bob Marshall Wilderness Complex (BMWC) is extensive and unique. More than 500 miles of stream and 35 lakes support populations of native and introduced species of salmonids. Waters within the BMWC represent a genetic stronghold for two native fish species of special concern, bull trout and westslope cutthroat, and provide thousands of angler days of recreation. These species are excellent indicators of our fishery and wilderness management programs.

The South Fork Flathead River drainage supports a fish assemblage similar to that of the Middle Fork. However, the river is isolated from the Flathead system by Hungry Horse Dam. Bull trout and some westslope cutthroat migrate between Hungry Horse Reservoir and the South Fork drainage within the BMWC. Information from tag returns has indicated that most cutthroat in the upper South Fork are fluvial residents of the river. Westslope cutthroat in the upper portion of the river were genetically tested and found to be genetically pure.

The ten productive lakes in the drainage support mostly rainbow and Yellowstone cutthroat. MDFWP Region 1 is presently testing fish in these lakes for genetic characteristics and planting westslope cutthroat in some of these lakes.

The Middle Fork Flathead River drainage supports a unique complex of migratory and resident native species including the bull trout, westslope cutthroat trout and mountain whitefish. Westslope cutthroat trout in the Middle Fork Flathead River are less numerous than in the South Fork. Tributaries of the Middle Fork represent important nursery areas for migratory westslope cutthroat trout populations from the Middle Fork Flathead River, and migratory bull trout populations in Flathead Lake. Cutthroat populations (genetically untested) exist in 12 mountain lakes in the Middle Fork drainage within the BMWC. Populations are maintained by planting in six lakes and natural reproduction in six lakes.

The Blackfoot River drainage within the BMWC provides some of the best spawning habitat available for large, fluvial bull trout which inhabit the Blackfoot and North Fork Blackfoot rivers. Other species in the drainage include westslope cutthroat, rainbow, hybrids of rainbow and westslope cutthroat, Yellowstone cutthroat, brook trout and mountain whitefish.

Little information is available for major tributaries in the drainage within the BMWC. Major drainages include the North Fork Blackfoot, Landers Fork of the Blackfoot, the East Fork of the North Fork Blackfoot River and Monture Creek. Seven mountain lakes support Yellowstone or cutthroat populations of undetermined genetic origin. A baseline study to collect fisheries information for management is needed in the drainage.

Streams draining the East Front within the BMWC support an important fishery for rainbow, cutthroat and eastern brook trout. Major East Front drainages include the North and South forks of the Sun River, the Dearborn River and streams in the Great Bear Addition (within the Teton and Marias river drainages).

WILDLIFE OF THE BOB MARSHALL WILDERNESS COMPLEX AND SURROUNDING AREA

Preface and Acknowledgments

This section of the report on wildlife of the Bob Marshall Wilderness Complex (BMWC) was compiled by biologists from the Montana Department of Fish, Wildlife and Parks.

The focus of this report is on elk, with brief reviews of other big game and special interest species. Information on elk was reported upon by Gayle Joslin, mule deer by Gary Olson, white-tailed deer and mountain lion by Shawn Riley, moose by Kurt Alt, bighorn sheep by John McCarthy, mountain goat by Bob Henderson and Gayle Joslin, black bear by Jim Cross, grizzly bear by Arnold Dood, and wolves by Arnold Dood and Gayle Joslin. Assistance in data collection from forest plans by Bob Martinka is appreciated.

The final section of the wildlife report that addresses indicator species, standards and guidelines, was developed by Shawn Riley.

Wildlife Introduction

The Bob Marshall Wilderness Complex (BMWC) ecosystem is important to many species of wildlife and provides exceptional outdoor recreational opportunities. Although many areas of the state have been developed over the years, the BMWC ecosystem has maintained a back-country tradition where hunting has remained relatively unchanged and the recreational values offered are not only exceptional in Montana, but rare in the entire country. Important big game populations occur in the ecosystem, but elk hunting has historically provided the majority of recreational opportunity. In order to maintain traditional wildlife values, attention must focus on activities and management within statutory wilderness, and upon other areas essential to the welfare of wilderness wildlife populations.

Elk were selected as a key wildlife species because there is an available information base and because they attract the majority of wilderness users for at least 3 months of the year, primarily the fall hunting season. The land area addressed in

this report is defined as the BMWC elk ecosystem, or that area in and around the wilderness complex which is used by elk.

Elements covered in developing this wildlife plan include current elk distribution and population levels, land ownership, past elk management practices and trends in harvest, land management throughout the ecosystem and on winter ranges, and brief reviews of other big game species within the elk ecosystem. Information relative to waterfowl, upland game, nongame, and furbearers is recognized as an important part of wilderness management. Unfortunately there is not enough specific information to begin addressing all the species that depend upon this wilderness environment. That unfortunate reality in no way demeans the presence, nor diminishes the importance, of other game and non-game wildlife found in the BMWC.

A broader perspective of wildlife habitat and security needs throughout the BMWC ecosystem is essential to maintaining wildlife recreational opportunities within the wilderness. Likewise, management of statutory wilderness alone will not sustain wildlife populations. Many wildlife values of the wilderness are contingent upon lands surrounding the wilderness complex. Management of these lands, particularly the public lands, will determine the future status of BMWC wildlife. Numerous opportunities do exist to assure wildlife values through sensitive land management practices on adjacent non-wilderness lands.

ELK -- AN INDICATOR SPECIES

Study Area

The study area (Figure 1) is defined on the basis of elk distribution. Elk within this area range from Glacier National Park (GNP) on the north to the Blackfoot-Clearwater valley on the south, and from the Swan Valley on the west to the foothills of the Rocky Mountain Front on the east. The heart and bulk of this vast elk range is the Bob Marshall, the Great Bear, and the Scapegoat wilderness areas. For purposes of this discussion it is called the BMWC elk ecosystem. It encompasses 3,923,448 acres.

The physiography of the Bob Marshall ecosystem is described by Alt (1985). The grinding action of several great ice ages, combined with intermittent periods of melting and erosion, sculpted and gouged the mountains which constitute the ecosystem. The tallest peaks range from 8700 to 9400 feet. Relief from

valley floor to mountain top exceeds 5000 feet on all sides of the complex.

No brief discussion can explain the weather of the BMWC, and yet climate is a major influence on wildlife use patterns throughout the ecosystem. Over 60% of the ecosystem's moisture falls in the form of snow, although patterns of snow fall are quite variable. Westerly weather systems bring heavy snow to the Swan Range, while dry Arctic fronts are often drawn southward by low pressure cells occurring to the south of Montana. These often extremely cold systems, are usually relatively dry. However, deep snows do accumulate along the Rocky Mountain Front, usually during the coldest months, by a process known as upsloping (Graetz 1985).

Warm dry winds howling down the east slopes of the Continental Divide were called snow eaters (chinooks) by the Indians. These winds free the open rolling slopes of the Rocky Mountain Front, and are the driving climatic force of the eastern edge of the ecosystem. In contrast to the Front, the snow laden valleys of the Swan, Flathead, and Blackfoot Rivers are typical of western Montana valleys which often experience moist maritime storm tracks. Temperature extremes range from over 100° to -60°F. Summer weather may vary from cool drenching rains to hot dusty winds.

Reflecting the variability of the climate and lay-of-the-land, is the vegetation of the BMWC. Here too, the ecosystem is a house diverse and divided with cedar, hemlock, larch, white pine, devil's club, and ocean spray, among other species, occurring west of the Divide. Limber pine, horizontal juniper, and buffalo berry tend to occupy to the more arid regions east of the Divide. Detailed descriptions of vegetation throughout the ecosystem are given in Picton (1960), Knight (1970), Arno (1979), and Pfister et al (1979) and Harvey (1980).

Although the history of elk within the BMWC ecosystem is incomplete, that of the Sun River elk herd is well documented in Knight (1970) and Picton and Picton (1975). Reports relative to elk in the Flathead by Gaffney (1941), Rognrud (1950 and 1955), Pengelly (1960), and Simmons (1974), Biggins (1975), provide perspective to the story of elk in the BMWC.

Wildlife management in the BMWC ecosystem attempts to balance animal needs with climate, physiography, land management, and recreational demands. The MDFWP manages the ecosystem's wildlife through three administrative regions: the Flathead and Swan drainages occur in Region 1, the Blackfoot and Clearwater drainages occur in Region 2, and the Two Medicine, Badger, Birch, Teton, Sun, and Dearborn drainages occur in Region 4 (Figure 2). The term "Region" is used in this report when referring to this administrative arrangement.

Table 23. Alkalinity, conductivity, and flows measured at points on the Middle Fork of the Flathead River, October, 1980.

Site	Date	Alkalinity mg/l $CaCo_3$)	Conductivity (pmhos/cm)	Flow (cfs)
Middle Fork at Gooseberry Park	10/7	150	220	44.1
Middle Fork at Schafer Meadows	10/10	152	220	56.0
Middle Fork at Granite Creek	10/16	117	185	--
Middle Fork[a/] at Bear Creek	9/18	114	210	198

a/ Alkalinity and conductivity are from measurements made by the Montana Bureau of Mines and Geology, September 13, 1980 (U.S. Forest Service, unpublished data).

Water chemistry and flow data concerning tributaries of the Middle Fork Flathead River are limited. MDFWP measured various parameters for tributaries within the BMWC in 1980 and 1981 (see Appendix).

Maximum water temperatures in the Middle Fork drainage are reached in August and generally do not exceed 20°C (see Appendix report). Mean daily maximum temperatures in August ranged from 14.9°C in Ole Creek to 17.8°C in the Middle Fork Flathead River near Schafer Meadows.

Stream habitat was evaluated using a modification of the system developed by the Resource Analysis Branch of the British Columbia Ministry of the Environment (MDFWP 1983). Each tributary was surveyed by helicopter and divided into one or more reaches. Reaches were identified as portions of the stream having distinct associations of physical habitat characteristics.

Surveys were completed on 51 reaches of 21 major tributaries within the BMWC (Table 24). The Appendix Report includes a complete set of tributary maps delineating important habitat characteristics and barriers.

Table 24. Reach information for Middle Fork tributaries surveyed in 1980.

Drainage	Reach Number	Drainage Area (km^2)	Length (km)	Gradient (%)	Late Summer flow (cfs)
Long Creek		19.37	8.61	2.5	
	1		2.72	1.8	
	2		1.32	1.8	
	3		4.57	3.2	
Granite Creek		74.6	13.42	1.4	13.7
	1		7.89	1.7	
	2[a/]		5.53	1.0	
Lake Creek		19.37	7.43	1.6	21.4
	1		2.54	2.5	
	2		4.89	0.7	
Miner Creek		19.53	4.36	2.8	
	1		2.50	1.7	
	2		1.86	3.7	
Morrison Creek		133.10	22.39	2.0	28.5
	1		7.48	1.1	
	2		3.78	2.3	
	3		8.80	1.7	
	4[a/]		2.23	5.2	
Lodgepole Creek		49.2	10.66	1.1	
	1		6.53	1.1	
	2		4.13	1.0	
Whistler					
	1		3.12	1.6	
Schafer Creek		126.4	14.17	2.1	15.3
	1	4.60	0.4		
	2		1.13	2.1	
	3		4.78	1.0	
	4		3.66	6.0	
W. Fork Schafer					
	1		3.25	3.0	
Dolly Varden Creek		68.4	14.79	1.1	14.7
	1		13.05	1.00	
	2		1.74		
Argosy		15.4	5.19	3.5	
	1		1.46	5.8	
	2		3.73	2.7	

Table 24. (cont'd.)

Drainage	Reach number	Drainage area (km^2)	Length (km)	Gradient (%)	Late Summer flow (cfs)
Calbick Creek		21.70	4.3	2.3	2.5
	1		4.3	2.3	
Cox Creek		51.57	11.56	1.5	1.4
	1		3.27	0.4	
	2		6.15	1.6	
	3		2.14		
Clack Creek		36.57	10.56	3.8	9.9
	1		2.82	1.0	
	2		2.67	1.0	
	3		4.07	7.0	
Bowl Creek		46.80	17.19	2.5	18.3
	1		2.59	2.1	
	2		4.20	2.5	
	3		1.6	0.5	
	4		6.4	3.3	
	5		2.4	3.6	
Basin		25.25	10.5	1.3	4.1
	1		2.1	1.3	
	2		6.6	1.1	
	3		1.8	3.1	
Strawberry Creek		71.04	19.75	1.2	15.2
	1	4.88	0.5		
	2		7.53	1.1	
	3		5.07	1.9	
	4		2.27	1.0	
E. Fork Strawberry				5.00	3.6
	1		3.04	5.2	
	2		1.96		
Trail		49.91	11.74	2.0	9.6
	1		7.74	1.6	
	2		4.0	2.7	
Gateway		19.63	7.47	3.4	4.0
	1		2.49	2.9	
	2		2.16	4.0	
	3		1.77	4.8	
	4		1.05	1.2	
S. Fork					
	1	4.79	2.5		

Fish Populations

It is important to describe the methods used to census fish populations, and determine fish age and growth so that valid comparisons between studies can be made. Refer to the Appendix Report for a detailed description of methods used to obtain the data in this section.

Based on information collected during the Flathead River basin studies, it appears that adfluvial cutthroat are most common in the Middle Fork drainage below Bear Creek (just outside the BMWC). The majority of cutthroat in the river upstream of Bear Creek are thought to be fluvial fish. In 1989, MDFWP tested 26 fish from Cox Creek and 17 fish from the Middle Fork Flathead River near Schafer Meadows. All of these fish were found to be pure westslope cutthroat.

Bull trout in the Middle Fork Flathead system are adfluvial, growing to maturity in Flathead Lake and migrating into the river and tributary systems to spawn. Most juveniles rear in tributary streams from one to three years before returning to the lake. The bull trout has been designated a species of special concern in Montana because of the restricted distribution of the large adfluvial form and because of threats to spawning and rearing habitat.

Underwater fish counts were made in 120 pool, 41 run, 22 riffle, and 10 pocket water habitat units in the Middle Fork above Bear Creek within the BMWC during the summer of 1980. A total of 993 westslope cutthroat, 18 juvenile bull trout, 132 mature bull trout, and 5,762 mountain whitefish were counted by observers during fish density estimates.

Density estimates were made in mid summer for pool and run habitat units in a 23 km section of the Middle Fork above Schafer Meadows and a 48 km section below Schafer Meadows (Table 25).

Table 25. Fish densities (No./100 m^2) by age class in pool and run habitat units of the Middle Fork of the Flathead River during mid summer, 1980. Numbers of each feature snorkeled and numbers of fish observed are in parentheses.

Feature	Cutthroat trout Age I	Cutthroat trout Age II	Cutthroat trout Age III+	Bull trout Age I	Bull trout Age II	Bull trout Age III+	Mountain whitefish Mature	Mountain whitefish <152 mm	Mountain whitefish >152 mm
Middle Fork above Schafer Meadows (7/24 - 7/29)									
Pool (42)	.04 (13)	1.19 (342)	.41 (119)	---	---	.007 (2)	.06 (18)	.33 (96)	2.53 (727)
Run (7)	.09 (4)	0.51 (22)	.33 (14)	---	---	---	.02 (1)	.49 (21)	2.21 (95)
Combined (49)	.05 (17)	1.10 (365)	.40 (133)	---	---	.006 (2)	.06 (19)	.35 (117)	2.49 (822)
Middle Fork below Schafer Meadows (8/5 - 8/12)									
Pool (56)	---	0.01 (3)	.98 (330)	---	---	---	.11 (37)	.26 (86)	7.32 (2475)
Run (3)	---	---	.59 (10)	---	---	---	.29 (5)	--- (195)	11.46
Combined (59)	---	0.01 (3)	.96 (340)	---	---	---	.12 (42)	.24 (86)	7.52 (2670)

Total densities of cutthroat were 1.55 fish per 100 m^2 (about 92 sq yd) surface area in pools and runs in the river upstream from Schafer Meadows and 0.97 fish per 100 m^2 downstream. Only two juvenile bull trout were seen during these mid-summer estimates. River densities of mature bull trout on their spawning migration from Flathead Lake were 0.06 fish per 100 m^2 in the upper section and 0.12 fish per 100 m^2 in the lower section. Mountain whitefish densities were relatively high, averaging 2.84 fish per 100 m^2 in the upper section and 7.76 fish per 100 m^2 in the lower section.

Density estimates by species (Table 26) were made in late summer in the same two areas of the Middle Fork. These estimates were concentrated on 16 km (10 mi) of the river above Schafer Meadows (Gooseberry Park downstream to Cox Creek) and a 16 km section downstream from Schafer Meadows (from 3 m below Schafer Meadows downstream to Granite Creek). Fish densities were estimated in every third pool, run, and pocket water habitat unit, and every fourth riffle habitat unit. Pools were stream features with a definite shallowing at the head and tail of the feature. Runs were deeper than riffles but did not fit the category of pools or pocket water. Pocket water was an area of the stream where the flow is broken by boulders. Riffles were shallow areas of flowing, broken water.

Late summer density of cutthroat in pool and run habitats was less than half of that found in mid-summer estimates. Smaller densities in late summer may be due to oversummer mortality, movement of trout into tributary streams or out-migration to the lower Flathead River or Flathead Lake. More juvenile bull trout were observed in late summer than in early summer. Densities of mature bull trout spawners was twice as high in the upper section and similar in the lower section in the mid-summer and late summer estimates.

Densities of cutthroat and juvenile bull trout in pocket water habitat units in both sections was similar to that found in run habitats and slightly lower than pool densities. No cutthroat trout and very few juvenile bull trout were seen in riffle habitats. Riffles were dominated by mountain whitefish in both river sections averaging just over one fish per 100 m^2 surface area. The average density of mountain whitefish in all features combined was more than ten times greater than the average total trout density.

Table 26. Fish densities by age class for pool, riffle, run, and pocket water habitats in 16-km sections of the Middle Fork of the Flathead River above and below Schafer Meadows during late summer, 1980. Number of features snorkeled and numbers of fish observed in each age class are in parentheses.

Fish per 100 m^2 Surface Area

Feature	Cutthroat Trout			Bull Trout			Mountain Whitefish		
	Age I	Age II	Age III+	Age I	Age II	Age III+	Mature	<152 mm	>152 mm
Middle Fork above Schafer Meadows (8/23 - 8/27)									
Pool (12)	.01 (1)	---	.38 (44)	---	---	.02 (2)	.19 (22)	.43 (50)	2.30 (269)
Run (15)	---	.03 (2)	.26 (19)	.01 (1)	.04 (3)	.03 (2)	.15 (11)	.15 (11)	2.50 (185)
Riffle (11)	---	---	---	.03 (1)	---	.06 (2)	000	.15 (5)	.98 (33)
Pocket water (6)	---	.07 (2)	.22 (6)	.13 (3)	---	.04 (1)	---	.13 (3)	2.43 (66)
Combined (44)	.004 (1)	.016 (4)	.27 (69)	.02 (5)	.012 (3)	.027 (7)	.12 (33)	.27 (69)	2.17 (553)
Middle Fork below Schafer Meadows (9/5 - 9/8)									
Pool (10)	.01 (1)	---	.40 (30)	---	---	---	.24 (18)	.01 (1)	10.91 (820)
Run (16)	.01 (2)	---	.09 (24)	---	---	.004 (1)	.07 (20)	.04 (11)	2.1 (583)
Riffle (11)	---	---	---	---	---	---	---	.20 (14)	.86 (59)
Pocket water (4)	.07 (1)	---	.34 (5)	---	---	---	---	.27 (4)	3.78 (56)
Combined (41)	.01 (4)	---	.13 (59)	---	---	.002 (1)	.10 (38)	.07 (30)	3.48 (1518)

An estimate of total surface area of each feature was calculated. The estimate was based on the total number of each habitat unit in two 16-km (10 mi) sections and average feature size measured on randomly selected features in each reach. A population estimate for each species in the 16 km sections was based on the average density of species in a randomly selected sample of each feature or habitat unit (Table 27). The number of mature adfluvial bull trout was estimated by actual counts of all likely looking habitat in each 10 mile section.

Mountain whitefish dominated the river fish population estimate calculated in this manner, outnumbering trout by more than ten to one. Cutthroat trout in the two sections averaged 575 fish per 16 km (10 mi). This estimate represents late summer numbers of the resident fluvial (river-dwelling) population of cutthroat after summer mortality or migration had occurred. Early summer population numbers of cutthroat were probably much higher. Accurate estimates of juvenile bull trout numbers, especially age I, were difficult to make in the river due to their secretiveness and association with the rocky substrate. They were common under rocks along the river margin, but very few were seen in snorkeling estimates. Mature bull trout were generally easy to observe because of low flows and good water clarity. They were observed mainly in pools and runs. Numbers were generally largest in areas just below the mouths of major bull trout spawning tributaries.

In 1988, MDFWP conducted snorkel-Peterson estimates of westslope cutthroat in the Schafer and Gooseberry section of the river. Workers estimated 216 (±62) cutthroat in the 1.6-mile Gooseberry section and 110 (±41) cutthroat in the 2.5-mile Schafer section. Only 6.5% of the cutthroat in the Gooseberry section were greater than 10 inches. All trout in the Schafer section were less than 10 inches. Drought conditions in the summer of 1988 may have contributed to these low estimates.

MDFWP caught cutthroat in the Gooseberry section at a rate of 3.7 fish per hour. The mean length (n=78) was 191 mm, or 7.5 inches.

Tributaries

Westslope cutthroat trout were found in all Middle Fork tributaries surveyed in 1979 and 1980 (Table 28). Residence of adfluvial cutthroat in most tributaries of the Middle Fork within the BMWC remains uncertain because of the relatively small amount of stream trapping and tag return information available. Juvenile bull trout were observed in all but five of the tributaries surveyed.

Table 27. Estimates of number of cutthroat trout, bull trout, and mountain whitefish in 16-km (10 mi) sections of the Middle Fork of the Flathead River above and below Schafer Meadows. Estimates are based on snorkeling in late summer. These numbers are useful for relative comparison and are not considered total estimates of the population.

Number of Fish per 16-km

Area	Cutthroat trout			Bull trout			Mountain whitefish		
	Age I	Age II	Age III+	Age I	Age II	Age III+	Mature[a/]	<150 mm	>150 mm
Above Schafer Meadows	10	41	670	61	29	6	42	720	5,850
Below Schafer Meadows	28	1	401	<1	55	<1	58	220	10,620

a/ Estimated numbers per km is based on actual counts.

Densities of westslope cutthroat trout in the reaches surveyed (Table 29) averaged 4.2 fish per 100 m^2 of surface area (about 25 fish per 100 linear yards of stream). Stream reaches supporting greater than 10 cutthroat/100 m^2 were identified as critical rearing areas. These included nine reaches of Gateway, East Fork Strawberry, Basin, Cox, Argosy, Challenge, and Twenty-five Mile creeks. Investigations showed that the number of cutthroat in a reach of tributary was related to the amount of fish cover in the form of logs, debris, etc. present in that reach (Fraley and Graham 1982).

Densities of juvenile bull trout were lower than those of cutthroat, partly because of the difficulty in observing the bottom-oriented bull trout (Table 27). Densities of juvenile bull trout in reaches where they were present averaged 1.7 fish/100 m^2 (about ten fish per 100 linear yards of stream). Critical areas for bull trout rearing (as identified by supporting densities of at least 1.5 bull trout/100 m^2) included nine reaches of Whistler, Morrison, Charlie, Strawberry, Granite, Long and Tail creeks.

A total of 333 pools, 425 runs, 441 riffles, and 108 pocket water areas were snorkeled in 1979 and 1980 (including North Fork tributaries). Densities of age II and III+ cutthroat were largest in pools, followed by runs, pocket water areas, and riffles in order of decreasing abundance (see Appendix Report). Bull trout densities varied little between features, except for age II fish which had substantially larger densities in pools than in other features.

Refer to the Appendix Report for maps showing all the fisheries characteristics of each Middle Fork tributary.

Table 28. Fish distribution in upper (above Bear Creek) Middle Fork tributaries, + = species present, - = species absent, * = migratory cutthroat (confirmed by trapping and tagging), ? = unknown, needs further study.

	Cutthroat Trout		
	Migratory	Resident	Bull trout
Charlie	?	+	+
Long	?	+	+
Bergsicker	?	+	+
Twenty-five Mile	?	+	+
Granite	*	+	+
Challenge	*	+	+
Dodge[a/]	*	+	+
Lake	?	+	+[b/]
Miner	?	+	-
Morrison	*	+	+
Lodgepole	?	+	+
Whistler	?	+	+
Schafer	?	+	+
W. Fork schafer	?	+	-
Dolly Varden	?	+	+
Argosy	?	+	+
Calbic	?	+	=
Cox	?	+	-
Clack	?	+	+
Bowl	?	+	+
Basin	?	+	+
Strawberry	?	+	+
E. Fork Strawberry	?	+	+
Trail	?	+	+
S. Fork Trail	?	+	-
Gateway	?	+	+

a/ Outside the BMWC boundary
b/ Bull trout were present below the falls.

Table 29. Mean densities (No./100 m^2) of cutthroat and juvenile bull trout in Middle fork tributaries surveyed during the summer of 1979 and 1980. Total for each species refers to age classes I, II, and III+ combined.

Fish per 100 m^2 Surface Area

Stream	Reach No.	Cutthroat Trout Age 0	Age I	Age II	Age III+	Total	Bull Trout Age 0	Age I	Age II	Age III+	Total
Charlie Cr.	001	0.5	1.0	2.0	1.0	4.0	1.5	5.6	0.7	---	6.3
	002	---	---	---	0.3	0.3	---	4.5	4.2	---	8.7
Long Cr.	001	---	---	---	---	---	---	---	0.2	---	0.2
	002	0.2	---	0.2	0.5	0.7	---	0.2	0.7	0.3	1.2
	003	---	0.2	0.5	0.1	0.8	---	0.6	0.4	0.9	1.9
Bergsicker	001	---	---	---	0.6	0.6	---	---	0.4	---	0.4
Twenty-five Mile Cr.	003	---	5.7	5.0	3.0	13.7	---	---	---	---	---
Granite Cr.	001	---	---	---	0.5	0.5	---	---	0.7	1.4	2.1
	002	---	0.2	---	1.3	1.5	0.1	---	0.2	---	0.2
Challenge	001	1.3	3.8	6.6	3.5	13.9	---	---	---	0.25	0.25
Lake Cr.	001	---	---	0.3	2.1	2.4	---	---	---	---	---
	002	---	---	---	0.5	0.5	---	---	---	---	---
Miner Cr.	001	---	---	---	1.3	1.3	---	---	---	---	---
	002	---	---	---	2.8	2.8	---	---	---	---	---
Morrison Cr.	001	---	---	---	0.2	0.2	---	0.2	0.3	0.3	0.8
	002	---	---	---	0.7	0.7	---	0.5	1.1	2.4	4.0
	003	---	---	0.6	3.0	3.6	---	---	2.7	5.1	7.8
	004	---	---	---	---	---	0.4	0.5	0.5	0.3	1.3

Table 29 (cont'd.)

Fish per 100 m^2 Surface Area

Stream	Reach No.	Cutthroat Trout Age 0	Age I	Age II	Age III+	Total	Bull Trout Age 0	Age I	Age II	Age III+	Total
Lodgepole Cr.	001	---	---	0.1	0.4	0.5	---	0.3	---	---	0.4
	002	0.2	0.8	2.3	1.2	4.3	---	0.2	---	0.2	0.4
Whistler Cr.	001	---	---	0.2	1.2	1.4	---	0.5	5.5	1.2	7.2
Schafer Cr.	001	---	0.1	---	---	0.1	0.1	---	---	---	0.1
	002	---	0.1	0.5	1.1	1.7	---	---	---	---	---
	003	---	---	0.8	3.1	3.9	---	---	---	---	---
	004	---	1.3	1.7	0.9	3.9	---	---	---	---	---
W.F. Schafer	001	---	0.7	2.2	2.6	5.5	---	---	---	---	---
Dolly Varden	001	---	---	0.1	0.1	0.2	0.1	---	---	---	0.1
Argosy Cr.	001	---	---	0.2	1.0	1.2	---	---	---	0.4	0.4
	002	---	2.2	7.9	1.3	11.4	---	0.9	0.2	---	1.1
Calbic Cr.	001	---	2.4	4.1	0.6	7.1	---	0.6	---	---	0.6
Cox Cr.	001	---	---	0.1	0.3	0.4	---	---	---	---	---
	002	1.1	1.1	2.7	6.5	10.3	---	---	---	---	---
Clack Cr.	003	---	---	---	0.6	0.6	---	---	---	---	---
Bowl Cr.	001	---	---	0.2	---	0.2	---	---	---	---	---
	002	---	---	---	0.3	0.3	---	---	---	---	---
	003	0.1	1.0	1.2	2.4	4.6	---	0.2	0.4	0.2	0.8
	004	---	0.3	---	0.6		0.9	---	---	0.1	0.3 0.4
	005	---	---	0.2	---	0.2	---	---	---	0.2	0.2
Basin Cr.	001	0.4	3.0	4.2	4.5	11.7	---	0.1	---	---	0.1
	002	1.2	1.3	3.4	2.0	6.7	---	---	0.5	0.1	0.6
	003	---	0.2	1.4	11.9	13.5	---	---	---	0.7	0.7

Table 29 (cont'd.)

Fish per 100 m^2 Surface Area

Stream	Reach No.	Cutthroat Trout Age 0	Age I	Age II	Age III+	Total	Bull Trout Age 0	Age I	Age II	Age III+	Total
Strawberry	001	---	---	---	0.1	0.1	---	---	---	0.1	0.1
	002	---	0.7	2.6	2.0	5.3	---	0.2	0.2	0.3	0.7
	003	---	---	---	0.1	0.1	---	---	0.2	---	0.2
	004	---	0.2	0.4	---	0.6	---	0.2	3.1	---	3.3
E.F. Strbry	001	---	---	2.1	9.6	11.7	---	---	0.6	0.8	1.4
	002	---	0.3	---	0.8	1.1	---	---	---	0.3	0.3
Gateway Cr.	001	---	---	0.5	0.3	0.8	---	0.4	0.5	0.2	1.1
	002	---	---	0.4	1.3	1.7	---	---	---	---	---
	003	0.6	3.3	4.0	3.2	10.5	---	---	---	---	---
	004	2.0	1.8	18.7	6.7	27.2	---	---	---	---	---

CUTTHROAT TROUT

Age and Growth

Eighty-seven percent of the cutthroat trout caught in tributary streams were 0-3 years old at time of aging, while 86 percent of the fish caught in the river were 3-5 years old. We determined that 75 percent of the fish collected in the Middle Fork Flathead River had reared two or three years in the tributaries before entering the river (see Appendix Report). About 22 percent had reared one year in tributaries. Lengths of fish each age class were larger in the river than in the tributaries (Table 30).

Table 30. Calculated lengths and increments of length (from scale samples) for cutthroat trout collected in the Middle Fork of the Flathead River and tributaries in 1980.

Number	Length at Age (annulus)	(mm)	Age of Fish 1	2	3	4	5
		Middle Fork Flathead River					
1	0	--					
2	16	51	95				
3	82	49	99	154			
4	69	50	97	156	217		
5	17	51	107	161	217	269	
Grand Mean Calculated Length			50 (2.0 in)	99 (3.9 in)	156 (6.1 in)	217 (8.5 in)	269 (10.6)
Number of Fish			(184)	(184)	(168)	(86)	(17)
Length Increment (mm)			50	49	57	61	52
		Middle Fork Tributaries					
1	45	49					
2	135	51	95				
3	164	51	95	138			
4	24	48	90	141	191		
5	4	59	101	139	204	251	
Grand Mean Calculated Length			51 (2.0 in)	95 (3.7 in)	139 (5.5 in)	193 (7.6 in)	251 (9.9 in)
Number of Fish			(377)	(327)	(191)	(28)	(4)
Length Increment (mm)			51	44	44	52	47

Cutthroat captured by Department anglers in the Middle Fork Flathead River in 1980 averaged 9.3 inches in length (Table 31). Over one-third of the cutthroat were greater than ten inches. Cutthroat captured by Department anglers in tributaries of the Middle Fork averaged 5.7 inches.

Table 31. Size distribution of westslope cutthroat trout caught by department anglers in the Middle Fork of the Flathead River and in tributaries to the Middle fork Flathead River during summer, 1980.

Number of Fish	x Length	% > 6" (150 mm)	% > 8" (200 mm)	% > 10" (250 mm)	% > 12" (300 mm)
		Middle Fork Flathead River			
184	9.3" (237.4 mm)	95.1	78.8	38.0	12.5
		Middle Fork Tributaries			
381	5.7" (145.5 mm)	47.8	13.6	3.4	1.0

Back-calculated lengths of bull trout based on juveniles and adult spawners collected in the Middle Fork drainage differed substantially from lengths calculated from juveniles only (see Appendix Report). It appears that back-calculations for annuli 1, 2, and 3 (age marks relating to year 1, 2 and 3 in the life of the fish) are not accurate when adult spawners are included in the calculations. A total of 40 otoliths (inner ear bones) from juvenile bull trout were aged. Ages assigned otoliths and scales from the same fish were in nearly 100 percent agreement.

Average length of adult bull trout spawners collected by hook and line in the Middle Fork drainage in 1980 was similar to average lengths recorded for adult bull trout in some previous studies in the Flathead River system (Table 32).

Refer to the Appendix Report for more detailed information on age and growth of fish in the Middle Fork drainage.

Food Habits of Trout

Ephemeroptera (mayflies), Diptera (true flies) and Trichoptera (caddis flies) were the major orders of insects in the diet of cutthroat less than or equal to 110 mm (4.3 in) in length in tributaries of the Middle Fork Flathead River (Appendix B). In the diet of cutthroat greater than 110 mm in length, major orders were Hymenoptera (terrestrial adults), Diptera adults, and Trichoptera.

Diets of cutthroat from the Middle Fork Flathead River included winged adults of the orders Trichoptera, Diptera, and Ephemeroptera (see Appendix Report). Large cutthroat trout in the Middle Fork Flathead River and tributaries feed largely on the water surface for winged insects.

Mayflies were by far the most important insect order in stomachs of both small and large bull trout in tributaries of the Middle Fork Flathead River. Other important orders in bull trout diets were Diptera and Trichoptera.

Baetidae was the major family in bull trout stomachs collected in the Middle Fork drainage, followed by Ephemerellidae and Siphlonuridae (see Appendix Report). Siphlonuridae was not a major mayfly family in Middle Fork benthic insect samples, but its presence in bull trout stomachs indicated selection for this family. The "free swimming" habits of siphlonurids may make them easier prey for the juvenile bull trout. Although Heptageniidae was the major mayfly family in the Middle Fork benthic samples, it was not the predominant family in the stomachs of juvenile bull trout collected from the Middle Fork drainage.

Table 32. Comparison of lengths of adult bull trout collected in the Middle Fork drainage with previous studies in the Flathead River system.

Study	Average Length (mm)	Number of Fish
Middle Fork, BMWC, 1980	618	35
North Fork Creel Census, 1979	638	36
Flathead River, all Forks, Creel Census, 1975	628	46
Middle Fork River Trap at Bear Creek, 1957	622	87

Table 33. Numbers of bull trout redds in tributaries of the Middle Fork Flathead River during years when nearly complete surveys were conducted.

Tributary	1986	1982	1981	1980	Average
Strawberry	41	39	21	17	30
Trail	53	30	26	31	35
Bowl	36	19	10	29	24
Clack	16	7	7	10	10
Schafer	30	17	12	10	17
Dolly Varden	42	36	31	21	33
Morrison[a/]	52	86	32[b/]	75	61
Lodgepole	42	23	18	14	24
Granite[a/]	37	34	14[b/]	34	30
Bear[c/]	21	23	12	9	16
Long*	*	*	8	--	
Charlie	*	*	*	7	--
Ole	36	51	23	19	32
Nyack[c/]	27	23	14	14	20
Lake	*	*	*	1	--
Dirtyface	*	*	*	0	--
Elk	*	*	*	1	--
Coal[c/]	3	*	13	*	25
Park[c/]	87	*	13	*	25
Total Middle Fork		523	388	237	300

a/ Portions of the stream are outside the BMWC.
b/ Counts low due to ice cover.
c/ Entire stream is outside BMWC.

Table 34. Catch information from voluntary creel cards returned in 1979, 1980 and 1981. Number of fish caught is in parentheses.

Year	Number of Anglers	Total Angler Hours	Catch per Hour		
			Cutthroat Trout	Bull Trout	Mountain whitefish
1979	44	228	1.61 (367)	.08 (19)	.91 (197)
1980	38	243	1.68 (408)	.05 (11)	.97 (236)
1981	26	113	1.21 (137)	.05 (6)	.36 (41)

Survey of Bull Trout Spawning Sites

Numbers of bull trout spawning sites (redds) in tributaries of the Middle Fork Flathead drainage have ranged from 237-523 during years when all streams were surveyed (Table 33). During these years, bull trout spawning sites in the Middle Fork drainage averaged 46 percent of the total basin-wide count (including the North Fork). The majority of bull trout from Flathead Lake which spawn in the Middle Fork drainage enter tributaries within the BMWC.

Bull trout redds have been counted in selected streams within the BMWC annually since 1979. These "monitoring counts" have fluctuated but generally indicate a stable spawning population.

Microhabitat measurements (size, water depth) of bull trout redds varied between tributaries (see Appendix Report). Redds averaged 2.2 m (2 yd) in length and 1.0 m (0.9 yd) in width, and were built in water depths averaging 0.26 m (0.3 yd).

Survey of the Fishery

Westslope cutthroat trout were the most numerous species in the recreational catch on the Middle Fork Flathead River from 1979-1981 based on voluntary creel card returns from anglers (Table 34). Anglers released approximately half of the cutthroat and most of the mountain whitefish caught. The release rate for bull trout was variable between years, ranging from 90 percent in 1979 to 33 percent in 1981.

In 1988 and 1989, MDFWP conducted creel card surveys in the entire BMWC. Returns for the Middle Fork drainage were low (Table 35). Only 11 anglers returned cards in 1988, reporting 20 individual trips to specific waters.

In 1980, Department anglers caught cutthroat in the Middle Fork Flathead River at a rate of 2.15 fish per hour (Table 36). Bull trout catch rates averaged 0.33 fish per hour. These rates (especially for bull trout) were higher than recorded in 1962, but anglers in 1980 had the advantage of fishing areas where snorkel surveys had located mature bull trout.

Catch rates during 1980 in Middle Fork tributaries within the BMWC ranged from 0.5 to 12.5 fish per hour (Table 37). Mean lengths of cutthroat ranged from 134 mm to 293 mm.

Table 35. Results from creel card surveys of anglers in the Middle Fork drainage during 1988 and 1989.

	1988	1989
Number of angler trips surveyed	20	17
Number of angler hours	110	81.25
Percent outfitted	20	0
Percent fished river	75	59
Percent fished creek	25	35
Percent fished lake	0	6
Tackle used		
Flies	40	67
Lures	15	0
Bait	0	0
Combination	40	0
No information	5	33
Westslope cutthroat caught	88	13
number per hour	0.8	.16
percent kept	35.0	15.0
percent > 12"	9.0	18.0
Bull trout	7	0
number per hour	0.07	--
percent kept	14.0	--
Percent > 12"	14.0	--
Mountain whitefish	23	0
number per hour	0.2	--
percent kept	48.0	--
percent > 12"	2.0	--

Mountain Lakes

Information on mountain lakes in the Middle Fork drainage within the BMWC is limited (Table 38). Cutthroat populations (genetically untested) exist in 12 lakes. Populations are maintained by planting in six of the lakes and by natural reproduction in six of the lakes. The level of fishing pressure and harvest in these lakes is not well documented. Fishing use is relatively high on Stanton, Marion, Scott, Flotilla and Castle, and relatively light on Dickey, Tranquil (east and west), Cup and Almeda.

Table 36. Catch rates (number of fish per hour) from hook and line sampling by Fish, Wildlife and Parks personnel on Middle Fork of the Flathead River within the BMWC during the summers of 1962 and 1980. the number of fish caught of each species is in parenthesis.

Year	Total fisherman hours	Number of Fish Caught per Hour		
		Cutthroat trout	Bull trout	Mountain whitefish
1962	164	.71 (117)	.06 (1)	.25 (39)
1980	104	2.15 (224)	.33 (35)	.62 (20)
1988	Gooseberry			
1988	Schafer			

Table 37. Catch information from hook and line sampling during the summer of 1980 by Department personnel on tributaries to the Middle Fork Flathead River within the BMWC.

Stream Name	Number Caught	Angler Hours	Fish/ Hour	Minimum Number Measured	Maximum Length (mm)	Length (mm)	Average Length (mm)	Average Length (inches)
Granite	15	3.5	4.3	15	220	325	265	10.4
Lake	4	--	--	4	230	280	254	10.0
Morrison	6	5.5	1.1	4	255	310	293	11.5
Lodgepole	4	2.0	2.0	3	120	162	143	5.6
Schafer	30	6.0	5.0	30	105	228	153	6.0
Dolly Varden	6	13.0	0.5	3	187	248	217	8.5
Cox	15	6.0	2.5	12	135	216	176	6.9
Bowl	24	4.0	6.0	24	101	250	146	5.7
Basin	75	6.0	12.5	75	75	202	134	5.3
Strawberry	8	4.0	2.0	4	135	310	192	7.6
Trail	10	3.0	3.3	9	120	240	180	7.1
Gateway	1	1.5	0.7	1	252	252	252	9.9

Table 38. Fisheries information for lakes in the Middle Fork drainage within the BMWC (Wct - westslope cutthroat, Rb - rainbow trout, FSu = Finescale sucker, Mwf = Mountain Whitefish, Yct = Yellowstone cutthroat). Year of the most recent plant is in parentheses.

Lake	Species	Planted/Natural	Common Size Range
	Middle Fork Drainage		
Stanton	Wct, Mwf, FSu	Natural	8 - 13"
Marion	Wct, (Rb/Wct)?	Natural	10 - 12"
Almeda	Wct	Planted (1988)	12 - 16"
East Tranquil	Wct	Natural	10 - 18"
West Tranquil	Wct	Natural	13 - 20"
Elk	Wct	Planted (1988)	13 - 17"
Castle	Wct	Planted (1989)	11 - 18"
Scott	Wct	Natural	13 - 15"
Flotilla	Wct (Yct/Wct?)	Natural	9 - 16"
Cup	Wct	Planted (1988)	11 - 16"
Dickey	Wct	Planted (1990)	10 - 13"
Bergsicker	Wct	Planted (1990)	11 - 13"

BLACKFOOT RIVER DRAINAGE

Description of the Drainage

The Blackfoot River flows 122 miles in a westerly direction from its source near the continental divide to its confluence with the Clark Fork River at Bonner, Montana (Figure 8). Principle tributary streams in downstream order are: Alice, Landers Fork, Nevada, North Fork, Chamberlain, Monture, Clearwater, Belmont, Gold, and Union creeks. The Landers Fork, North Fork, Clearwater and Monture creeks are the largest of the Blackfoot's tributaries; three of these originate in the BMWC (Clearwater does not). The Blackfoot River drainage in non-wilderness areas has and continues to be used extensively for timber production, mining, and livestock production. Segments of the Blackfoot River tributaries that occur in the BMWC dissect high elevation mountainous terrain and generally reach the broad Blackfoot River Valley shortly after leaving the wilderness and national forest boundaries. The Blackfoot River is essentially a "free-flowing" stream except for a small diversion near the mouth that serves the wood products mill at Bonner.

Fishing and other forms of water-based outdoor recreation are important in the Blackfoot drainage. The formation of the Blackfoot River Conservation and Recreation Management Plan to assure orderly public access through private lands in 1977 has greatly increased the availability of the Blackfoot River to recreationists. A recreational user survey conducted in 1977 during the first year of the plan found that, below the Clearwater River, anglers comprised 80 percent of the recreational users of the Blackfoot River. Campers and non-fishing floaters accounted for most of the remaining 20 percent of recreational users. The river corridor development resulted in the reclassification of the Blackfoot River to a Class 1 stream in the state of Montana river classification system.

A total fishing pressure estimate based on statewide mail survey in the 1984-85 fishing season was 40,824 angler-days (334 per mile). Most of the fishing pressure occurred below the Clearwater River with a pressure estimate of 832 man-days per mile. The Blackfoot contains wild populations of rainbow, westslope cutthroat, Yellowstone cutthroat, brook, brown, bull trout, and mountain whitefish. Western Montana's best trophy fluvial bull trout population resides in the Blackfoot River.

Densities of the large bull trout were estimated at one to two fish per mile in the lower Blackfoot by the MDFWP. Tributary streams originating in wilderness area are known to be key spawning streams for the fluvial bull trout.

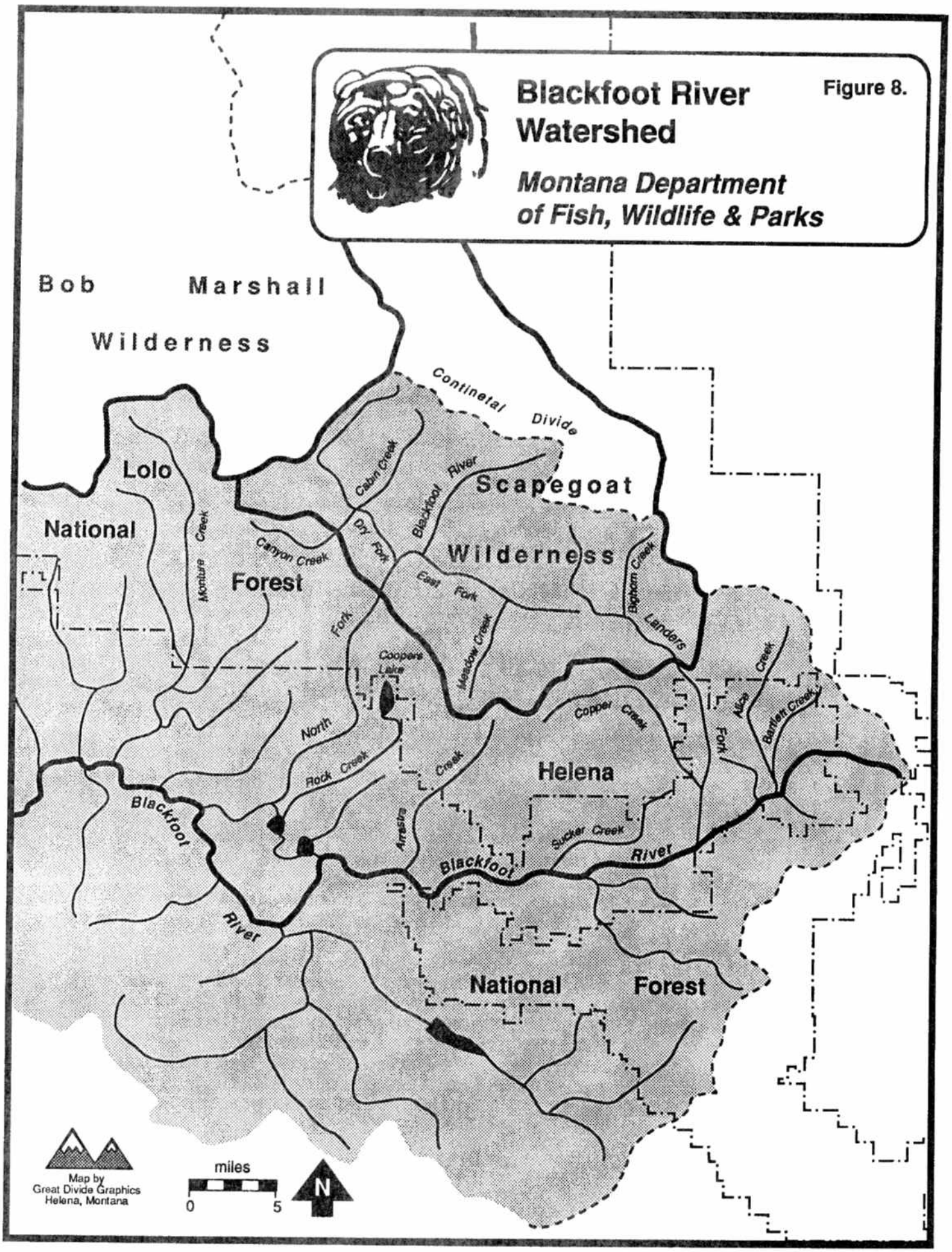
In 1988, MDFWP conducted a creel card angler survey in the Blackfoot drainage within the BMWC. Anglers surveyed fished 73 hours and caught 46 cutthroat (0.6 fish per hour), one bull trout and two mountain whitefish. Most anglers fished lakes.

Stream discharge on the Blackfoot River near the mouth averages 1,633 cubic feet per sec (cfs) and has ranged from 19,200 cfs (June 10, 1964) to 200 cfs (January 4, 1950) USGS (1986). Instream flows for recreational purposes were appropriated for the Blackfoot River in 1970 by the Montana Fish and Game Commission.

The Blackfoot River drainage portion of the Bob Marshall wilderness complex provides some of the best spawning opportunities for the large fluvial bull that inhabit the Blackfoot and North Fork of the Blackfoot River. The landforms that make up these drainages have been notoriously unstable with frequent mass ground movements even in the wilderness area. The hydrology of the drainages appear to be similar for all the major streams. These streams have reaches that go dry in the low flow months because of loss of stream flow to subsurface aquifers. The stream flows generally reappear as separate spring creeks and within the stream channel downstream several kilometers. This hydrologic feature probably contributes to the successful spawning of the bull trout and helps reduce the impacts of the unstable land movements. Studies in the Flathead drainage have identified this hydrologic pattern as being important to successful spawning in the Flathead and Swan drainages.

Fisheries by Drainage

All of the drainages that follow in this section have one characteristic in common: an inadequate habitat and biological database. The lakes in the Blackfoot drainage have received some attention but the streams, including the major drainages, have essentially no significant data collections. The Blackfoot drainage currently holds the best populations of trophy fluvial bull trout in the state. However, these unique fish are found in very low densities and spawning runs in tributaries are extremely small, sometimes numbering a single spawning pair.


Blackfoot River Watershed
Figure 8.
Montana Department of Fish, Wildlife & Parks
Bob Marshall Wilderness
Continental Divide
Lolo National Forest
Scapegoat Wilderness
Helena National Forest
Cabin Creek
Blackfoot River
Dry Fork
Canyon Creek
Monture Creek
East Fork
Meadow Creek
Bigham Creek
Landers Fork
Coopers Lake
North Fork
Rock Creek
Arrastra Creek
Copper Creek
Sucker Creek
Alice Creek
Bartlett Creek
Blackfoot River
Blackfoot River
Map by Great Divide Graphics Helena, Montana
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LANDERS FORK OF THE BLACKFOOT RIVER

The Landers Fork is suspected to contain bull trout, westslope cutthroat, brook trout, sculpin, and mountain whitefish. No data exists for trout populations within the wilderness boundaries. A fall stream flow measured by MDFWP personnel at the highway 200 crossing was 44 cfs. The Landers Fork goes underground in a section below the wilderness boundary like several other streams and sections of streams in the upper Blackfoot River drainage.

Tributaries

Tributary streams of the Landers Fork include Fickler, Baking Powder, Lookout, Lake, Maryann, Middle Fork and Crow creeks. No fisheries information is available for most of these streams. Bighorn Creek was planted with 3,600 undesignated cutthroat 2.5 cm long in 1950. These fish originated from the hatchery in Ovando. Baking Powder Creek was planted with 3,100 rainbow trout 2.5 cm long in 1952. Ringeye Creek was planted with 4,000 undesignated cutthroat 2.5 cm long in 1943 from the hatchery in Ovando.

Lakes

Bighorn Lake. Bighorn Lake, located 24 km by trail up the Landers Fork and Bighorn Creek, has a good wild population of lakeshore-spawning cutthroat trout. The wild population probably originates from the 1952 plant of 6,800 cutthroat trout from the Ovando hatchery. Records in the regional office of the MDFWP based on phenotype only indicate that the fish are Yellowstone cutthroat. However, no records exist to indicate a plant of Yellowstone cutthroat was ever made in the lake. Recent findings concerning the diverse phenotypes in westslope cutthroat certainly preclude a conclusion that the lake is inhabited by Yellowstone cutthroat. The lake is 5.4 hectares in area and has a maximum depth of 16 m.

This lake population of cutthroat is currently in a near natural condition and does not appear to be impacted by fisherman harvest in regards to population age and size distribution. The long distance to the lake coupled with a lack of other significant destinations make the trip to Bighorn Lake a single goal trip and helps reduce pressure. Angler trips into the lake in 1985 indicate that both size and numbers of cutthroat are

being maintained with the current pressure. All efforts to improve access into this area or closely adjoining areas should be avoided because of the highly vulnerable nature of this cutthroat fishery.

The Canyon Creek fire of 1988 burned the timbered perimeter around the lakeshore.

Little Crystal Lakes (unnamed lakes northeast of Heart Lake). Two of the four lakes have the capability to produce a fishery. The middle largest lake (Little Crystal T16N, R8W, S17CB) had a remnant population of rainbow trout through the 1970s which has disappeared in the 1980s according to the local game warden. The other lake (upper Little Crystal T16N, R8W, S17CA) was planted with 200 westslope cutthroat in 1977 (unsuccessful in establishing a fish population). The lakes are both 6 m maximum in depth and less than 1 hectare in area.

The lakes are located next to Heart Lake, which has been heavily used over the past several years, but because of no trail access Little Crystal Lakes have received no noticeable use. No trail should ever be constructed to these lakes. A fisheries could be reestablished in both of these lakes.

Heart Lake. Heart Lake is located 9 km from the trailhead at Indian Meadows which is a major access trail for the Lincoln-Scapegoat Wilderness. The lake has a surface area 13.4 ha and a maximum depth of 15.2 m. A small outlet, with about 0.056 cubic meters per second (CMS) flow in the spring, drains into the Landers Fork via an unnamed tributary. Heart Lake was first planted in the early 1930s with grayling and, again, in the 1960s, a total of 874,000 2.5 cm fish were introduced. Undesignated cutthroat were planted during the period 1942 to 1952 at a rate of 3,000 to 16,000 (fry to 5 cm) for a total of 48,000 introduced. Rainbow were planted once in 1937 (10,000 rainbow fry).

Overnight gillnet sets in 1959 caught cutthroat and grayling at a rate of 1 and 2.5 per set respectively. An overnight gillnet set in 1968 produced 29 grayling and no cutthroat. The grayling averaged 25.4 cm (10 in) TL and ranged between 22.6 and 37.3 cm TL. An overnight gillnet set in 1975 produced 39 grayling with an average length of 37.3 cm TL and a range of 35.0 to 40.6 cm TL. Grayling ages were determined from scales and ranged from five to seven years in the 1975 sample. Angler and warden reports from Heart Lake in 1986 indicate that the grayling population disappeared. In 1974, the lake had an estimated use of 202 angler-days based upon statewide mail survey which may be conservative.

This lake with a 30 percent littoral zone has produced good grayling fishing in the past and could be considered for reintroduction of the grayling and periodic replanting. The plant in 1965 appeared to survive for at least ten years which would probably be a good planting cycle. In 1988, MDFWP planted 5,000 westslope cutthroat trout in the lake, and in 1989, 20,000 grayling were also planted.

Webb Lake. Webb Lake, a moderately productive moraine lake, is located about 11 km from the Indian Meadows trailhead. A USFS guard station cabin is built on one end of the lake and is used by administrative crews while in the area. Webb Lake is 2.7 ha in surface area and has maximum depth of 1.3 m. The outlet drains into an unnamed tributary to Ringeye Creek which flows into the Landers Fork. Webb Lake always has a high amount of turbidity that probably contributes cover for the fish residing there. Cutthroat trout captured in gillnets appear to be Yellowstone cutthroat.

Webb Lake was planted from 1940 to 1952 with an undesignated strain of cutthroat from hatcheries in Anaconda and Ovando. The annual plants of 5 cm fish varied from 1,000 to 15,000 for a total of 50,000 fish through the period. Two overnight gillnet sets in 1959 captured an average of 15 fish per set with an average TL of 29.5 cm and a range of 19.0 to 48.8 cm TL. The length frequencies of the catch indicated a healthy fish population. In 1968, a gillnet set caught 27 cutthroat with average TL of 29.5 cm and a range of 15.7 to 47.7 cm TL. The gillnet data confirmed that Webb Lake supported self-sustaining fishery of unknown genetic make-up. Webb Lake in 1974 supported an estimated 300 angler-days.

EAST FORK OF THE NORTH FORK OF THE BLACKFOOT RIVER

Fish species present probably include westslope cutthroat and bull trout. Rainbow trout and Yellowstone cutthroat may be present but are not confirmed. This drainage is in need of extensive survey work for any definitive management plan to be developed.

Historical fish planting records revealed that this stream was planted several times between 1940 and 1952 with 4,000 to 12,000 2.5 cm undesignated cutthroat. The earlier plants originated from the hatchery in Ovando and the later plants came from the Anaconda hatchery.

Tributaries

Tributary streams of the East Fork of the North Fork Blackfoot include Sourdough, Meadow, East Fork Meadow, Mineral, Camp, Spaulding, Lost Pony, and Scotty creeks. Very little information is available for these streams.

Historical fish planting records indicate that Meadow Creek was planted several times between 1932 and 1952. The plants of undesignated cutthroat trout 2.5 cm long numbered between 6,000 to 42,000 annually. The planted fish originated from the Anaconda and Ovando hatcheries. In 1945, 12,000 rainbow trout 5 cm long were also planted in this creek.

Fish species expected to be present include: undesignated cutthroat, rainbow, rainbow x cutthroat hybrids, and bull trout. In the 1984 statewide pressure estimates, this stream had an estimated annual pressure of 594 angler-days.

Scotty Creek was planted in 1943 and again in 1948 with undesignated cutthroat 5 cm long from the hatchery in Ovando. The plants numbered about 2,000 fish each.

Lakes

The immediate watershed and shoreline area of several of the lakes in the drainage (e.g., Twin Lakes) were burned by the 1988 Canyon Creek fire and fish populations were reportedly affected. The exact nature and extent of the impact on the fishery has not been measured.

Meadow Creek Lake. This lake has a surface area of 5.1 ha with a maximum depth of 1.0 m. The lake was formed by a valley recessional moraine. No scientific data collections have been made on the lake. The cutthroat trout found in this lake are suspected to be Yellowstone cutthroat. This lake receives an estimated annual fishing pressure of about 100 angler-days. The naturally reproducing population could sustain more angling pressure but shoreline impacts would probably accompany the increased pressure. Historical fish planting records revealed several fish plants between the years 1932 to 1952. A total of 500,000 undesignated cutthroat and 29,280 rainbow trout were planted in 1937. The cutthroat originated from both the Anaconda and Ovando hatcheries and the rainbow from the Ovando station.

Upper Twin Lake. This lake has a surface area of 2.6 ha and a maximum depth of 3.0 m. The lake drains into an unnamed tributary to the East Fork of the North Fork Blackfoot River. The lake has never been stocked. This lake is accessible by trail 13 miles up Meadow Creek trail. In 1968, a single overnight gillnet set caught 17 undesignated cutthroat ranging in size from 17.8 to 55.9 cm long. In 1985, a fisherman reported numerous fish between 5.0 and 30.5 cm long. The species would probably be similar to the lower Twin Lake population which is suspected to be Yellowstone cutthroat. MDFWP planted 4,000 westslope cutthroat trout in Upper Twin Lake in 1989.

Lower Twin Lake. This lake has a surface area of 6.3 ha and a maximum depth of 3.0 m. The lake drains in an unnamed tributary of the East Fork of the North Fork Blackfoot River. Abundant undesignated cutthroat populate this lake with natural reproduction. The cutthroat that inhabit this lake are suspected to be Yellowstone cutthroat that were probably introduced with the fish plants of 1950 and 1952. Historical planting records show that 3,600 and 10,000 2.5 cm long cutthroat were planted respectively in 1950 and 1952. The fish came from the Anaconda hatchery.

Parker Lake. This lake has a surface area of 8.9 ha and is formed by a recessional moraine. The maximum depth of the lake is 1.3 m. Visual and angler surveys of the lake described the population of cutthroat trout as abundant. The naturally reproducing population of cutthroat in Parker Lake are suspected to be Yellowstone cutthroat. Fish planting records indicate that from 3,000 to 6,000 undesignated cutthroat were planted per year between the years 1942 and 1952. The planted fish originated from the hatchery at Ovando. The estimated annual fishing pressure is 100 angler-days. Parker Lake is accessed by trail 16 km from the trailhead at Indian Meadows.

NORTH FORK OF THE BLACKFOOT RIVER

This stream is the largest of the tributaries to the Blackfoot River. A major falls forms a natural barrier to upstream fish movement 9.6 km above the wilderness boundary. The North Fork supports a significant fall run of large fluvial bull trout from the Blackfoot and is suspected to have a resident population in addition to the migratory fish. The wilderness portion of the North Fork also supports a population of cutthroat trout of an undesignated species and may have some rainbow and/or Yellowstone cutthroat. MDFWP counted 11 and 12 bull trout redds, respectively, in 1988 and 1989. A key area is from the crossing below the North Fork guard station to the first falls.

Historical fish planting records show the river was planted throughout the period 1932 to 1954. The plants were made with both rainbow and undesignated cutthroat and numbered from 2,000 to 22,000 annually. The fish originated from the hatcheries in Anaconda and Ovando.

Tributaries. Tributaries of the North Fork Blackfoot River include Jakey, Cabin, Canyon, Dwight, South, Sorgo, Theodora, Cooney, Broadus, Eagle and Dabrota creeks, and the Dry Fork of the North Fork. Very little fisheries information exists for these streams. The Dry Fork was planted from 1928 to 1952 with 6,000 to 10,000 undesignated cutthroat 2.5 cm long. Cabin Creek was planted in 1952 with 6,000 undesignated cutthroat from the Anaconda hatchery. Cooney Creek was planted with 20,000 rainbow trout in 1941 and 4,000 undesignated cutthroat in 1950 from the Ovando hatchery. Dabrota Creek was planted in 1950 with 3,600 undesignated cutthroat 2.5 cm long from the Ovando hatchery.

No productive lakes exist in the drainage within the BMWC.

EAST FRONT DRAINAGES

North Fork Sun River

The North Fork of the Sun River originates along the continental divide and flows south to its junction with the South Fork of the Sun River at the head of Gibson Reservoir (Figure 9). The upper portion of the North Fork drainage and the entire west side of the drainage is timbered, while grass-covered hills follow the east side of the lower portion of the drainage. The summer flow of the North Fork ranges from 100 to 150 cubic feet per second (cfs).

Major tributaries of the North Fork Sun River include Headquarters, Rock, Biggs and Moose creeks. Summer flows in tributaries to the North Fork range from 5 to 50 cfs. Three of the ten mountain lakes in the North Fork drainage support fish populations.

South Fork Sun River

The South Fork of the Sun River flows north from its origin on the continental divide to the junction with the North Fork at Gibson Reservoir. The drainage is timbered except for a meadow section at Pretty Prairie. Summer flows in the South Fork range from 100 to 150 cfs. The West Fork is the largest tributary in the drainage. One of the five mountain lakes in the drainage within the BMWC supports fish.

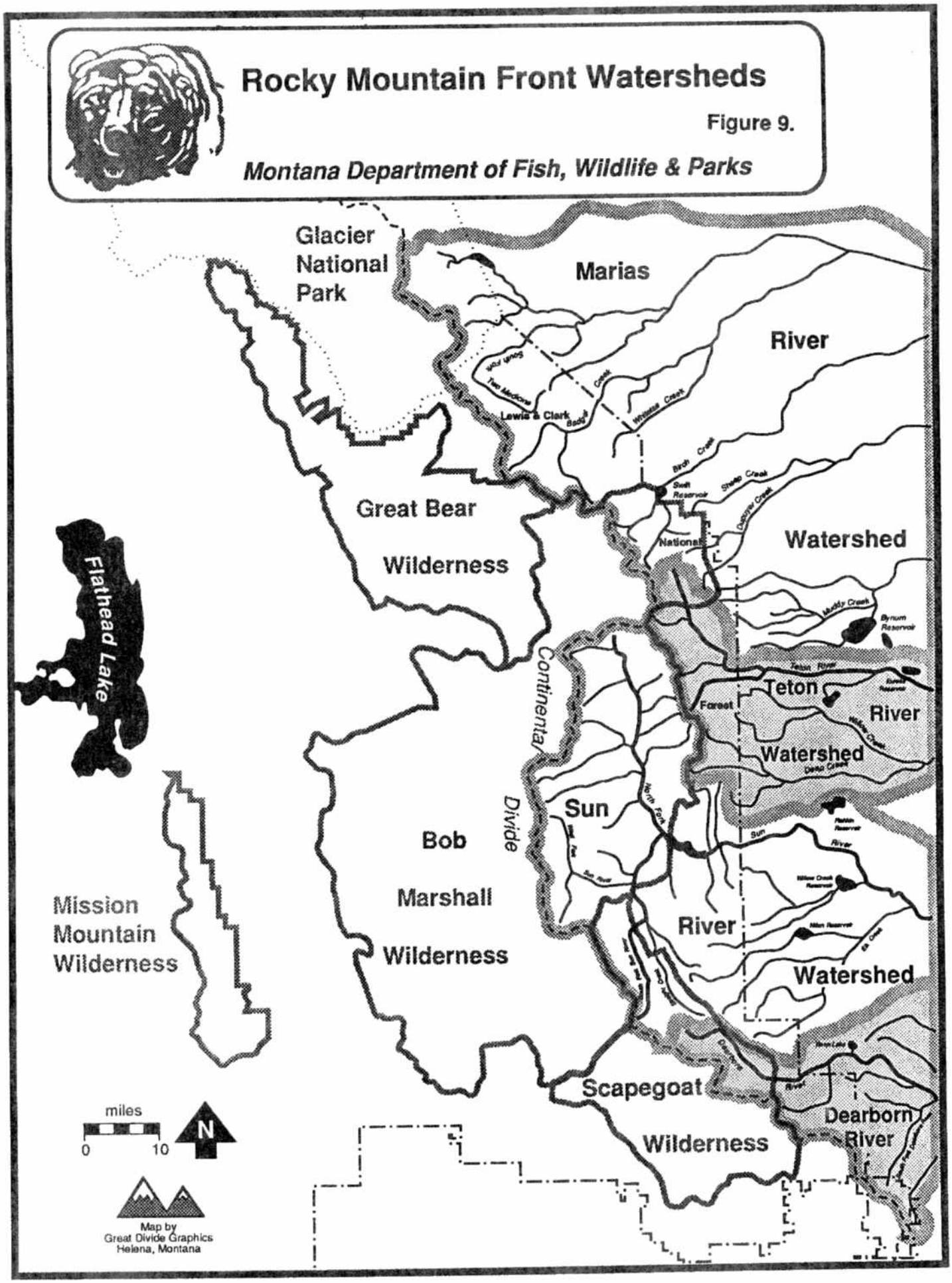
Dearborn River

The Dearborn River originates along the continental divide near Scapegoat Mountain and flows east-southeast to the downstream BMWC boundary. In the upper portion of the drainage, the stream meanders through a timbered floodplain. In the lower reaches, the Dearborn flows through a steep-walled canyon. There are no mountain lakes in the drainage which support fish.

Streams in the Great Bear Addition

There are eight major streams in the proposed Great Bear addition. Tributaries in the Marias drainage include the North, Middle and South Forks of Birch Creek, and the North and South

Forks of Dupuyer Creek. Streams in the Teton drainage include the North and East forks of the Teton River, and Bruce Creek. Impacts of the 1964 and 1975 floods are still evident in all these drainages. There are no mountain lakes in the drainages.


Rocky Mountain Front Watersheds
Figure 9.
Montana Department of Fish, Wildlife & Parks
Glacier National Park
Marias River Watershed
Great Bear Wilderness
Flathead Lake
Continental Divide
Teton River Watershed
Sun River Watershed
Bob Marshall Wilderness
Mission Mountain Wilderness
Scapegoat Wilderness
Dearborn River Watershed
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Map by
Great Divide Graphics
Helena, Montana

FISH POPULATIONS

North and South Forks of the Sun River

Fisheries information is limited on the forks of the Sun River within the BMWC. Most of the information was gathered to assess the effects of the two fish angling limit (1975-1983) on the trout population in the forks. After 1983, the general stream limit for the BMWC applied (three fish, none over 12 inches).

Average lengths of rainbow trout in the North Fork Sun River from 1975 to 1989 ranged from 9.8 to 12.2 inches (249 to 310 mm). Lengths of rainbow trout in the South Fork Sun River ranged from 10.9 to 12.7 inches (277 to 323 mm) (Table 39). Other species present on the forks include cutthroat trout, hybrids of cutthroat and rainbow trout, and eastern brook trout.

Table 39. Length frequency of rainbow trout (and Rb, Ct, RbxCt in 1989) in the North and South forks of the Sun River from hook-and-line surveys (Expressed as percent of the total trout sampled).

Length group greater than or equal to	1975	1976	1977	1978	1979	1983	1985	1989
North Fork								
10 inches (254 mm)	70.6	74.0	81.0	92.1	67.1	77.0	82.0	45.0
11 inches (279 mm)	54.4	59.4	66.0	81.7	52.1	63.0	67.0	30.0
12 inches (305 mm)	29.4	41.7	51.0	68.3	37.0	39.0	42.0	18.0
13 inches (330 mm)	17.6	22.9	34.0	35.7	20.5	15.0	22.0	4.0
Number of fish in sample	68	96	41	126	73	73	75	67
Average length (all fish)	10.9	11.3	11.5	12.2	10.7	11.3	11.6	9.8
South Fork								
10 inches (254 mm)	71.2	80.0	91.0	80.8	86.0	88.0	87.0	79.0
11 inches (279 mm)	56.0	63.3	84.0	64.2	64.7	79.0	75.0	50.0
12 inches (305 mm)	40.8	50.5	79.0	49.5	44.1	46.0	48.0	28.0
13 inches (330 mm)	30.6	24.8	51.0	37.9	29.4	18.0	39.0	10.0
Number of fish in sample	59	102	70	95	68	82	61	104
Average length (all fish)	11.4	11.8	12.7	11.8	11.6	11.8	12.2	10.9

Rainbow trout generally reach 10 inches (254 mm) in the forks of the Sun River during their third year of life (Tables 40 and 41). By their fourth year, rainbow exceed 12 inches in both forks.

Table 40. Length range and age class distribution of trout in the North and South forks of the Sun River, July 31 - August 1, 1979.

Stream	Species*	Number of Fish	Length Range (Avg)	Age Class	Number of Fish	Length Range
North Fork	Ct	12	7.5 - 12.0 (9.7)			
	Eb	2	6.0 - 7.0 (6.5)			
	RbxCt	4	8.9 - 16.2 (12.3)			
	Rb	73	5.3 - 14.5 (19.7)	I	10	5.3 - 8.6
				II	20	8.1 - 11.0
				III	42	9.3 - 14.5
South Fork	Ct	3	7.1 - 9.6 (8.7)			
	Eb	5	7.1 - 9.0 (7.8)			
	RbxCt	2	9.9 - 11.2 (10.6)			
	Rb	68	5.7 - 17.5 (11.6)	I	5	5.7 - 8.4
				II	17	7.8 - 12.2
				III	46	10.0 - 17.5

* Species abbreviations: Ct - cutthroat trout; Eb - brook trout; RbxCt - rainbow/cutthroat hybrid; Rb - rainbow trout.

Table 41. Calculated growth (in inches) of rainbow trout from the forks of the Sun River, August, 1975.

	Average Age Group	Age of Fish	Total Length at Each Year of Life I	II	III	IV	V
North Fork Sun River	I	6	4.4				
	II	11	3.7	7.0			
	III	30	3.8	7.2	9.7		
	IV	15	3.2	5.9	9.5	12.0	
	V	2	2	2.9	6.4	9.3	12.1 13.6
	Averages	64	3.6	6.8	9.6	12.0	13.6
South Fork Sun River	I	5	4.4				
	II	9	4.0	7.6			
	III	12	3.9	7.1	9.8		
	IV	12	3.9	6.9	10.3	12.9	
	Averages	38	4.0	7.1	10.1	12.9	

A preliminary snorkel estimate (see Appendix Report for methods) conducted on the South Fork Sun River on August 3, 1987, indicated a rainbow trout population of 191 fish in a 1.05 mile (1.68 km) section from Burnt Creek to Deer Creek. However, because of the physical characteristics of the stream section, the estimate was thought to be a minimum value.

MDFWP conducted a snorkel estimate on the South Fork Sun River from Windfall Creek to Bay Creek (1.061 mi) on August 11, 1989. Snorkelers estimated 908 fish in the section, or 856 fish per mile, rainbow and cutthroat trout combined.

Grayling were introduced in Rock Creek in the North Fork Sun River drainage in 1984. Survival and status of the plant are unknown. Some grayling have moved downstream to the North Fork.

Very little information exists on mountain lakes in the drainage within the BMWC (Table 42). Mean lengths of yellowstone cutthroat trout ranged from 10.1 to 14.2 inches in the four lakes with fish populations.

Table 42. Information on lakes in the Sun River drainage within the BMWC (all lakes contain yellowstone cutthroat).

Lake	Date of Survey	No. of Fish	Mean Length (inches)	Mean weight (pounds)
Bear (natural reproduction)	7/19-20/65	6	13.5 (12.8 - 13.9)	0.76 (0.63 - 0.84)
	8/11/76	4	14.2 (11.8 - 15.7)	---
Levale (natural reproduction)	7/21-23/65	36	10.1 (7.8 - 12.2)	0.36 (0.15 - 0.60)
Sock (planted every other year)	7/26/82	7	11.6 (10.0 - 14.7)	---
Unnamed (natural reproduction)	7/24/82	5	13.2 (9.7 - 18.5)	--

In 1988 and 1989, MDFWP conducted a creel card angler survey in the drainage (Table 43). Anglers surveyed fished 274 hours in 1988 and caught 336 rainbow, 91 cutthroat, and 69 brook trout. Species composition was similar in 1989. However, the catch rate for rainbow trout was more than twice as high in 1989.

Dearborn River

Almost no fisheries information is available for the Dearborn River within the BMWC. Reports indicate a viable fishery for rainbow and cutthroat trout. Whitetail Creek, a major tributary, contains cutthroat trout.

Streams In the Great Bear Addition

Limited information is available on these streams. Cutthroat were introduced in the South Fork of Birch Creek below Crazy Creek (near Pinto and Circus creeks) in 1974. In 1979, cutthroat ranging from 5 to 12 inches were captured in the section.

Cutthroat trout ranging from 7.7 to 10.0 inches in length were sampled in the North Fork of Birch Creek in 1971. In the North Fork of Dupuyer Creek, cutthroat (7.6 to 10.5 inches) and eastern brook trout (6.5 to 10.6 inches) were sampled in 1976. In the South Fork Dupuyer Creek, cutthroat from 2.3 to 9.8 inches were sampled in 1976.

Table 43. Results of a creel card angler survey on the Sun River drainage. Almost all anglers fished the north and south forks of the Sun River.

	1988	1989
Number of angler trips surveyed	40	26
Number of angler hours	274	124
Percent outfitted	23	10
Percent fished river	92	92
Percent fished creek	0	0
Percent fished lake	8	8
Tackle used (percent):		
Flies	38	40
Lures	0	5
Bait	5	0
Combination	50	25
No information	7	30
Westslope cutthroat caught:	91	74
number per hour	0.3	0.6
percent kept	21	11
percent > 12"	39	31
Brook trout caught:	69	39
number per hour	0.25	0.31
percent kept	3	3
Percent > 12"	0	3
Rainbow trout caught	336	350
number per hour	1.2	2.81
percent kept	18	6
percent > 12"	15	32

FOUNDATION ISSUES

Before addressing the goals of this planning process, it is important to identify the basic principles upon which the plan will be built. These items have been designated "Foundation Issues." These topics have been discussed throughout the planning process and they are generally accepted as valid. Six foundation issues form the basis for developing the fish and wildlife goals for the Bob Marshall Wilderness Complex. It is again acknowledged that the focus of these issues, and eventually the goals and strategies of the planning process, remains on elk and the other game species of fish and wildlife. This does not reflect a lack of interest or concern for other species occupying the BMWC ecosystem. What it does reflect is that elk and other game species have been the focus of conservation efforts in this region since the turn of the century and that this effort has been successful.

The six foundation issues are:

I. *Fish and game populations exist in a managed situation and environment that, while not pristine in a strict sense, is consistent with wilderness resource goals.*

This foundation issue recognizes two important points. First, the fish and wildlife resources may be considerably different from what they were under the pristine circumstance. Archeological evidence suggests that hunting, and traveling to hunting grounds along the Rocky Mountain Front, occurred in the BMWC ecosystem. This activity involved most species found there today and bison. The limited historical information available indicates a wildlife abundance on the northern plains that was systematically consumed by pioneer markets for hides, meat and bones. There was also indication of a scarcity of game in the mountainous country to the west of the great plains. By the turn of the century, wildlife populations in the mountains and on the plains were little more than remnants. Hungry Horse and Gibson Dams have altered aquatic systems and exotic species have been introduced into the area.

A second important point that needs to be noted is that conservation programs have restored substantial populations of wildlife and introduced new species of fish. These fish and wildlife populations are not a restoration of the original condition. The current fish and wildlife populations are the result of protection and management programs practiced both in and around the classified wilderness land. These programs were instituted long before passage of the Wilderness Act.

II. *Fish and wildlife planning must be approached in an ecological context, boundaries being dictated by the animals' needs. Those boundaries go beyond classified wilderness and, at times, beyond national forest boundaries.*

The BMWC ecosystem has been defined on the basis of elk distribution (Fig. 1). Although most of the elk summer ranges are within the classified wilderness, the species cannot prosper without protection for the land that sustains them in all seasons. The data base for elk distribution is substantial and supports a broad definition of the BMWC ecosystem. This definition is generally adequate for most other species considered in this analysis. The ecosystem definition is also reasonable from a fisheries perspective, with the exception of the exclusion of Flathead Lake.

Elk distribution defines a BMWC ecosystem of about 4 million acres (Fig. 1). The USFS manages 74% of the ecosystem. The next largest landowner is the private sector with 17%, followed by the State of Montana with 4%. Only 1% of this 4% is under the Montana Department of Fish, Wildlife and Parks (MDFWP) management. The remaining 5% includes: corporate lands, the Bureau of Land Management (BLM), the Blackfeet Indian Reservation, and Glacier National Park (GNP). Slightly more than half of the USFS lands (53%) are presently designated wilderness. This arrangement of land ownership and resource-management responsibility emphasizes the need to approach wildlife planning in an ecological context and with a cooperative attitude.

III. *Hunting and fishing will be wilderness oriented and emphasize primitive recreation within the BMWC ecosystem. A diversity of recreational experiences will continue to be offered within this primitive setting.*

The type of recreational areas most limited in Montana and elsewhere are places offering the primitive recreation experience. Places to hunt and fish in developed settings are already abundant and will increase as other public lands are further developed. Preservation of sites for primitive forms of recreation must occur both within and beyond wilderness boundaries if those forms of recreation are to be sustained.

Within this context, there will continue to be a high degree of diversity of opportunity. Archery seasons, early-rifle seasons and general seasons in addition to permit hunting, branch-antlered bull hunting and either-sex seasons will likely be part of the evolving management formula.

While the recreational emphasis will be on primitive backcountry activities within and around the wilderness,

season dates and types will be set to assure the perpetuation of game populations throughout the ecosystem.

IV. *Wildlife and fisheries management will strive to maintain population age structures approaching those occurring in pristine populations.*

Fish and wildlife management will emphasize the intrinsic values of fish and wildlife and the esthetics of the recreational experience. This emphasis will be more important than striving to achieve the maximum number of recreation days or the maximum rate of game harvest in the BMWC ecosystem. This emphasis is consistent with the Wilderness Act, the philosophy of those who were active in the movement that produced the Act, and contemporary users of the area. The present planning direction of the MDFWP for the elk population of this area is to maintain a diverse age structure in the bull segment of the herd. This planning direction is consistent with this foundation issue.

V. *Fish and wildlife recreational opportunities include hunting, fishing and appreciating their intrinsic values.*

The consideration of both consumptive and nonconsumptive uses and values of fish and wildlife are compatible and consistent with the traditional use of the area. These varied uses of fish and wildlife are also consistent with the Wilderness Act, the philosophy of the founders of the wilderness concept, and contemporary fish and wildlife management programs.

VI. *Individual perceptions of what the wilderness is, and what the recreational experiences in the wilderness are or should be, ought to be a consideration in the planning process. Fish and wildlife programs for the BMWC ecosystem, likewise should address user perceptions.*

Wilderness users and wilderness resource managers all have perceptions of what these areas are and what the human experiences related to them mean. These perceptions are probably as varied as the individuals who hold them and more diverse than the land that nurtures them. It was noted early in this planning process that Aldo Leopold counseled, "To promote perception is the only truly creative part of recreational engineering." The entire Limits of Acceptable Change (LAC) process is, in a sense, "recreational engineering." The perceptions of those using the BMWC ecosystem and those managing its resources need to become a visible part of this process. People's perceptions of what is wilderness and what type of recreational experiences can be expected in wilderness, will be discussed throughout the LAC process.

FISH AND WILDLIFE PLANNING GOALS AND STRATEGIES

The planning goals for the fish and wildlife resource of the BMWC ecosystem are presented for the species discussed in this process. The many other species living in this complex may benefit as more consideration is given to the featured species. It is important, however, that this not be assumed and forgotten. Programs need to be initiated that inventory and assess the condition of populations of other species inhabiting this wild land complex. At the same time managers and researchers must be sensitive to the need to minimize disturbance to land and animals in the wilderness. Research on species that do not exclusively inhabit wilderness areas should be conducted in the unclassified lands when that option is available. In this way, human disturbance of wilderness land and wildlife will be minimized.

WILDLIFE

Elk

It is the goal of this plan to maintain or improve elk population numbers, to sustain the current level of hunter opportunity, and to provide for the general public enjoyment. Some emphasis will be on providing mature bull elk in a backcountry setting. This goal includes increasing the elk population to compensate for expected wolf predation.

One of the purposes of this goal is to sustain or slightly increase the present hunter harvest of elk in the BMWC ecosystem while accepting some expected increase in predation with the recovery of wolves. To accomplish this, the base herd will have to be increased to produce enough additional elk to compensate for expected predation. This goal will be pursued with the following strategies:

1. Allow natural burns to occur according to prescription. In addition, consideration should be given to a prescribed fire policy within the ecosystem. These fires would be used to bring the ecosystem back into a natural vegetative mosaic which would have existed had fire suppression not been imposed the last 80 years.

The positive or negative consequences to wildlife would be accepted.

2. On winter ranges outside the wilderness boundary but within the BMWC ecosystem, elk habitat should be given priority in resource allocation.

3. Winter range acquisition and improvements should be pursued along the east and south perimeter of the BMWC. Emphasis should be directed south of the Dearborn River where publicly owned winter range is currently limited. This emphasis should include evaluating the effect of the 1988 fires on elk distribution and range use.

4. Cooperative efforts must be encouraged with the Blackfeet Tribe as they continue to develop their game-management program. There is considerable potential for improvement in the Badger-Two Medicine area.

5. The current program of creating and managing a vegetation disturbance regime that mimics natural disturbance and sustains early plant successional stages within the BMWC ecosystem outside the wilderness should be continued. This work on the South Fork Flathead River is sponsored under the Northwest Power Planning Act.

Mule Deer

It is the goal of this plan to provide for an unquantified increase in the mule deer population of the BMWC ecosystem through habitat manipulation outside the classified wilderness area.

Unlike the relatively stable elk populations, mule deer populations fluctuate considerably due to factors other than hunter harvest. Presently, elk are given management priority and this is generally expected to continue. When addressing mule deer, it is important to recognize differences in the management needs between the resident and migratory segments of the population. To sustain the current hunter harvest opportunity and accommodate increased predation, the habitat base suitable for mule deer needs to be improved or expanded. This goal will be pursued with the following strategies:

1. (The first strategy for mule deer is the adoption of the fire policy as described for elk.)

2. On winter ranges outside the wilderness but within the BMWC ecosystem, mule deer habitat needs should be given priority in resource allocation.

3. Vegetation manipulation outside the wilderness boundary will be conducted to favor plant species utilized by wintering mule deer where their key areas do not overlap important elk ranges.

White-tailed Deer

The goal of this plan for white-tailed deer is to have the population within the BMWC ecosystem fluctuate with the plant successional stages that affect their numbers.

The white-tailed deer populations have expanded within the wilderness with the maturing of old-age timber stands. At the same time, this habitat type has disappeared from managed timber lands around the wilderness but within the ecosystem. There is little evidence to suggest that whitetails migrate between the BMWC and adjacent timber lands within the BMWC ecosystem. Since there is little exchange between these areas, this plan will not address the needs of white-tailed deer beyond the wilderness boundary. The goal for white-tailed deer within the wilderness suggests no specific strategy.

1. Within the wilderness boundary, maturing forests are expected to sustain some white-tailed deer expansion. Natural burns will periodically recycle the vegetation community to the detriment of this species. This will be accepted.

Moose

It is the goal of this plan to encourage the expansion of moose throughout the BMWC.

Moose populations have demonstrated some expansion throughout the BMWC. This trend, perhaps now encouraged by plant successional changes initiated by the 1988 fires, can be maintained. This goal will be pursued with the following strategies:

1. Moose populations will be managed conservatively to maintain the gradual increase in populations that is apparently occurring.

2. The impact of wolf recovery on moose populations will be observed.

3. A fire policy within the wilderness, as described for elk, and a prescribed burn program outside the wilderness boundary will be pursued to assure proper vegetational stages for moose populations.

4. The impact of domestic grazing on riparian areas will be evaluated. Practices detrimental to balanced utilization of riparian vegetation will be modified if necessary to assure the production of forage normally utilized by moose.

Bighorn Sheep

It is the goal of this plan to manage bighorn populations and habitat to continue the recovery of this species and to expand their distribution, if possible, within the BMWC ecosystem.

The bighorn sheep population lives primarily along the eastern portions of the BMWC on wilderness and adjacent non-wilderness lands. Prior to 1983, the population peaked at about 1,200 animals but was reduced by disease to present levels. At the present time, there are about 900 bighorns in the Sun River segment of the population and about 100 living north along the Rocky Mountain Front. The goal for the Sun River segment of the bighorn population is to sustain a minimum of 800 bighorns having a recruitment rate of at least 30 lambs per 100 ewes and capable of providing a minimum of 40 3/4 curl rams for harvest annually. This goal will be pursued with the following strategies:

1. Continuation of the limited ram, limited ewe hunting season for the immediate future.

2. A fire policy within the wilderness as described for elk, and a prescribed burn program outside the wilderness boundary will be pursued to assure proper vegetational stages for bighorn sheep populations.

3. Evaluate habitat changes resulting from the 1988 burns and consider the transplant of bighorns into suitable historic range both within and outside of designated wilderness areas if natural dispersal fails to stock suitable habitat.

Mountain Goat

It is the goal of this plan to manage mountain goats to increase populations and distribution so that all available historic mountain goat habitat is filled, ultimately increase hunter opportunity, and to provide for the general enjoyment by the public.

Mountain goat habitat occurs "where you find it." Little can be done in the way of improving, manipulating or otherwise "creating" it. Because mountain goat terrain is fragile and goat behavior is inflexible, it is important that buffers exist to protect both the habitat and the animal from human disturbances. This goal will be pursued with the following strategies:

1. Within the wilderness boundaries, goat habitat is secure and the populations will be managed with conservative hunting seasons.

2. Emphasis will be on protecting habitats and herd units which do not occur within the existing wilderness boundary. In these areas, mountain goat habitat should be given top priority in resource allocation decisions.

3. Exterior to the wilderness, where island populations of goats are in jeopardy of being isolated, land-use decisions must favor maintaining linkages between island and main populations by avoiding human disturbance in or near travel corridors.

4. Distribution of mountain goats on historic and potentially suitable ranges, both within the wilderness and on associated non-wilderness lands, will be restored through management programs such as reintroduction (utilizing native stock), full protection and variable hunting seasons.

Mountain Lion

It is the goal of this plan to maintain mountain lion populations by maintaining the prey base that sustains them, primarily mule deer.

Little is known of mountain lion populations within the BMWC ecosystem other than that they exist and appear to be healthy. The objective will be to maintain productive and abundant ungulate

populations that typically support lion populations. The mountain lion goal will be pursued with the following strategies:

1. The strategies for maintaining the various ungulate populations that form the lion's prey base can be found under the individual goal and strategy discussions for each of those species.

2. A composite data base on mountain lions harvested from the ecosystem should be established to follow age and sex ratios of lions harvested. This data base would be used to avoid the over harvesting of females and to otherwise adjust harvest rates if necessary.

Black Bear

It is the goal of this plan to manage habitats that provide the opportunity for stable black bear populations.

Black bear populations are thriving in and around the BMWC ecosystem. The most productive populations are associated with the moist, west-side coniferous forests and berry fields. In some localized areas, with high grizzly bear densities, black bear populations appear depressed. This situation is natural and accepted. In most circumstances, measures taken to improve grizzly range will also benefit black bears. The black bear goal will be pursued with the following strategies:

1. Natural burns and prescribed fire should be promoted to create more edge and forage that favor bears.

2. Efforts should continue to elevate the public perception of the black bear. This species needs to be viewed as an animal that is an integral part of a healthy forested environment.

Grizzly Bear

It is the goal of this plan to manage the grizzly bear population and its habitat to continue and sustain the recovery of this species in the BMWC ecosystem.

The grizzly bear represents a truly wild vestige of primitive America that is being maintained in the wilderness setting of the BMWC ecosystem. The bear population has met or exceeded the recovery goals identified in the 1982 recovery plan. The responsible agencies are now considering taking the grizzly bear off the list of threatened and endangered species. Taking the bear

off the list, however, needs to be accompanied by creation of a process that assures the preservation or improvement of grizzly bear habitat within the BMWC ecosystem. It is also essential that bear management programs strive to maintain optimum population levels and current distribution throughout the ecosystem. This goal will be pursued with the following strategies:

1. The grizzly bear, like other species, is dependent on vegetative patterns established by precipitation, fire and plant succession. The fire policy described for elk and other species in this plan is appropriate for grizzlies within the wilderness. This impact of changing vegetative patterns is acceptable.

2. Education of recreation and other land users of the BMWC ecosystem in methods to minimize human/grizzly conflict should be emphasized.

3. Outside of the wilderness boundaries, grizzly bear habitat and security needs must be given priority consideration in resource allocation decisions.

Wolf

The goal of this plan is to accommodate the recovery of wolves in the BMWC ecosystem consistent with the objectives of the prey species that must sustain them.

Wolves have existed in and continue to extend their range into the BMWC ecosystem. Accomplishing and sustaining permanent recovery of this species depends upon sustaining a prey base for them to utilize and gaining broad public acceptance for their presence. Sustaining the prey base can be achieved by meeting the goals established in this plan for elk, mule deer, moose, mountain goats and bighorn sheep. Gaining public consensus for their permanent presence in the BMWC ecosystem will require developing a recovery program that allows for the management of wolves. Wolf management must include an emphasis on the condition of prey base, the shared utilization of that prey base, and the ability to kill or relocate wolves if necessary to keep their recovery in balance with other resource objectives. This goal will be pursued with the following strategy:

1. Promote a wolf management plan that includes maintaining and expanding the prey base, establishing recovery goals consistent with the capacity of the prey base to sustain wolves and hunting, and defining how competing demands for the various prey species will be resolved.

FISH

Westslope Cutthroat Trout

The goal of this plan is to maintain, at current or increased levels (as indicated by population estimates and angler success rates), the naturally reproducing populations of genetically pure westslope cutthroat trout in streams and lakes within the BMWC ecosystem. This goal includes the opportunity to catch and keep a small number of these trout for a wilderness subsistence experience.

Management of westslope cutthroat within the BMWC ecosystem should emphasize preservation of the population for its own values and emphasize a quality fishery over a production fishery. The ecosystem represents one of the major remaining strongholds of this species, so protection of the gene pool is critical. The goal for westslope cutthroat trout will be pursued through the following strategies:

1. Maintain the current angling limits of three fish, none over 12 inches in streams, and three fish with no size restrictions in lakes.

2. Protect the genetic integrity of westslope cutthroat by planting those fish over existing non-native fish species or by removing the exotic species from lakes within or draining into the BMWC.

3. Continue introductions of westslope cutthroat trout in selected lakes to establish genetically pure populations and to increase angling opportunity while protecting other resource values.

4. Protect fisheries habitat within, and in areas draining into, the BMWC. It is important to ensure no further degradation in vulnerable areas such as the Middle Fork Flathead drainage.

5. Manage trail systems in a manner consistent with the goals for westslope cutthroat trout with an emphasis on protecting water quality.

6. Isolating some areas by locating trails and stream crossings away from critical areas and isolating some areas by sustaining difficult or primitive access.

7. Increase enforcement of angling regulations through a cooperative effort between the USFS and MDFWP.

Bull Trout

The goal of this plan is to maintain, at current or increased levels (as indicated by redd counts), the naturally reproducing populations of migratory bull trout in streams and lakes within the BMWC ecosystem. This goal includes providing an opportunity for anglers to catch a trophy fish in a wilderness setting, but de-emphasizes harvest of this unique species.

This population of bull trout, living in a natural lake and migrating into an extensive and still largely accessible and unaltered headwater tributary system, is probably the only one of its kind left in the United States. Streams within the BMWC provide some of the most important spawning and nursery habitats for migratory bull trout in Flathead Lake and Hungry Horse Reservoir. Because of the ecological relationships within these expansive aquatic systems, management must be sensitive to conditions both within and beyond the BMWC. The goal for bull trout will be pursued with the following strategies:

too specific

1. Maintain the current angling limit of one fish per day and in possession. Consider an education program to encourage voluntary catch and release of only one mature fish per day. The stress of migration and spawning render this species very sensitive to angling. If necessary, further restrictions will be considered.

2. Protect fisheries habitat within and in areas draining into the BMWC. It is important to ensure no further degradation in vulnerable areas such as the Middle Fork Flathead River.

3. Locate trail crossings away from important spawning areas and maintain primitive or difficult access to critical habitat areas.

4. Increase enforcement of angling regulations through a cooperative effort between the USFS and MDFWP.

5. Encourage management of bull trout in a manner consistent with this goal outside the BMWC. Sound management of this species in Flathead Lake, Hungry Horse Reservoir and the river

corridors is required to protect the species within the BMWC ecosystem.

Other Game Fish

The goal of this plan is to emphasize recreational opportunity, primarily east of the continental divide, on populations of rainbow trout, brook trout, yellowstone cutthroat trout and mountain whitefish.

The primary emphasis of the fishery program is to favor native species in the BMWC. In this instance, it is done by focusing angling pressure on non-native fish. The whitefish is an under-utilized native fish that could absorb more angling pressure. The objective is to reduce the taking of native cutthroat and bull trout. Rainbow trout, brook trout, Yellowstone cutthroat trout and whitefish should be able to support increased angling pressure, provide more recreational opportunity and perhaps reduce pressure on westslope cutthroat and bull trout. The goal for these species will be pursued through the following strategies:

Easily outdated

1. Consider increasing the angling limit on rainbow trout in the Sun River drainage.

2. Develop and implement an education program to emphasize harvest of mountain whitefish for a subsistence experience within the BMWC.

3. Ensure that the management and education programs for these fish species are developed complimentary to the dominant fishery goal of preserving the westslope cutthroat and bull trout fish populations.

WILDERNESS USER PERCEPTIONS

The goal of this plan is to devise a methodology to address and deal with human perceptions of wilderness and the wilderness experience.

Most of the effort committed to this process has been directed toward the physical (land condition) and biological (fish and wildlife) resources of the BMWC ecosystem. Just as beauty and its identification belong to each person individually, the perception of what wilderness is and the experiences we seek there vary across a wide spectrum. If we are to follow Leopold's suggestion that, "To promote perception is the only truly creative part of recreation engineering", then we must devise ways to deal with

perceptions as well as realities. The ultimate goal will be to bring perceptions and reality as close together as possible so that wilderness, and the experiences we have there, are as genuine and fulfilling as possible.

Dealing with something as elusive and private as how people intuitively and instinctively relate to wilderness might be approached in two ways. First, an effort needs to be made to sample the spectrum of perceptions or expectations held by users of the BMWC ecosystem. This sampling should include both what the individual thinks the wilderness is, and what each person would like it to be. Second, a program should be developed that enriches the physical and intellectual environment in which ideas about wilderness and our relationship to it are formed. The first suggestion initiates a process of learning about contemporary feelings held by wilderness users which could be both enlightening and valuable to resource managers. The second suggestion approaches Leopold's idea of dealing with perceptions as a means of initiating "recreation engineering" as the only creative aspect of recreation management. The goal of dealing with wilderness user perceptions will be pursued through the following strategies:

1. Design and implement a study of the perceptions of wilderness experiences, expectations and management held by people interested in the preservation and use of the BMWC ecosystem.

2. Continue the LAC planning and implementation process as a means of preserving the physical environment in which wilderness perceptions will be formed.

3. Design and implement an educational program that develops and disseminates information about the philosophy and history of the wilderness movement and the BMWC ecosystem. This program will enrich the intellectual environment in which wilderness perceptions will be formed.

4. Integrate user perceptions and expectations into management plans for the BMWC ecosystem.

AFFIRMATION OF WILDERNESS MANAGEMENT CONCEPTS

The Wilderness Act speaks to wildlife only once, and in that reference, Section 4 (d) (8), it assures that "Nothing in this Act shall be construed as affecting the jurisdiction or responsibilities of the several States with respect to wildlife and fish....". It is incumbent upon wilderness resource managers however, to approach the management options for the BMWC ecosystem; within the context of the Act, consistent with the definition of wilderness, cognizant of the philosophy of those responsible for the Act, and aware of the conservation history of the land.

The BMWC ecosystem extends well beyond the boundaries of wilderness covering an area at least twice as large as the presently classified lands. This planning process suggests that it is both possible and desirable to approach fish, wildlife and habitat management, within the major portion of this ecosystem, consistent with the philosophy of wilderness and the spirit of the act.

There is a persistent notion about wilderness and wilderness ecosystems that often implies a static circumstance. The wildlife history of the BMWC ecosystem reflects a very dynamic situation. Moreover, changes in wildlife (game species) populations are the result of aggressive (game range acquisition) and passive (regulation) management programs. These, induced changes, are most evident on the eastern edge of the BMWC ecosystem where conservation programs are expanding wildlife populations and extending their ranges out through the foothills, and riparian areas of the northern plains. These activities (acquisitions, leases and easements) are beginning to extend effective habitat into the area of wildlife's greatest historical abundance.

Conversely, there are areas within the BMWC ecosystem where wildlife habitat, and its wildland character are threatened. Oil and gas exploration, timber sales, transportation plans and other habitat altering prospects have the potential to compromise wilderness associated wildlife habitat. Thus there is a dynamic tension at work within the BMWC ecosystem. It is a tension that can be managed to the benefit of fish and wildlife resources. Changes in the ecosystem can be kept within acceptable limits through adoption of wilderness management concepts along with pursuit of the Fish and Wildlife Planning Goals identified in this plan. Application of this management direction throughout the ecosystem should insure the security of fish and wildlife and the recreational experiences associated with them.

Wilderness and its management concepts are laid out in Section 2 (c) of the Act where it states,"...an area...retaining its primeval character and influence...which is protected and managed ...to preserve its natural conditions...", where there are, "...outstanding opportunities for solitude or a primitive and unconfined type of recreation...". The BMWC ecosystem management program can meet these expectations. These criteria are being met within the wilderness areas. Traditional and contemporary fish, wildlife and habitat conservation activities beyond the wilderness boundaries are consistent with the , "...public purposes of recreational, scenic, scientific, educational, conservation and historical use.", described in Section 4 (b) of the Act. Planning goals and strategies identified in this plan likewise conform to the concepts defined in the Act.

WILDLIFE INDICATORS, STANDARDS AND GUIDELINES

The hunting traditions within the Bob Marshall Wilderness Complex (BMWC) date back to subsistence hunting by Native Americans. Historically, the BMWC was one of only several areas in Montana that provided sport hunting for elk. Recreational opportunities afforded by the elk resource today are among the best and most sought after in America. This section describes current elk management, biological indicators and standards, and further management actions that may be needed to maintain those standards.

A Review of the Resource

The 6,250 square mile BMWC, as defined by the needs of elk, straddles the Continental Divide and includes the Bob Marshall, Great Bear, and Scapegoat Wilderness areas and adjacent federal, state, and private land. It encompasses portions of five ranger districts on the Lewis and Clark, Flathead, Helena and Lolo National Forests, as well as 18 hunting districts in Fish, Wildlife and Parks administrative regions 1, 2, and 4.

More than 80% of the 9,000 to 11,000 elk in the BMWC use wilderness habitats some time during the year and occupy at least 40 different winter ranges. However, 65% of the available winter range is outside wilderness boundaries and nearly 80% of the elk that summer in the wilderness migrate out to these non-wilderness winter ranges. Whereas private lands comprise only 21% of the land-base, 42% of the elk winter range is under private ownership. Privately owned winter and spring ranges predominately occur along the East Front and throughout the Blackfoot, Clearwater, and Swan valleys. The number of elk that can occupy these areas is dictated, in part, by these land ownership patterns and landowner tolerances. In addition, different portions of this very large unit have different potentials for raising elk. The elk that occupy the south and east sides of the complex consistently have higher calf survival than do the elk that live in the Middle Fork of the Flathead, deep within the BMWC. Conversely, the bull elk within the wilderness appear to have higher rates of survival through the hunting season than those in non-wilderness areas.

The entire BMWC is within the designated recovery zone for the northern rocky mountain gray wolf. If recovery goals for this species are met, a minimum of 50 wolves are anticipated to

occupy the complex. Wolf distribution is expected to coincide with the distribution of big game, and it is assumed that wolf predation will be additive to current hunting mortality.

The BMWC accounts for 12% of Montana's statewide total elk and total bull harvest, and 14% of the branched-antler bull harvest. It also provides hunting for 13% of the state's elk hunters and 7% of the hunter days of recreation. Annually, some 12,000 hunters spend 72,000 days afield and harvest about 1,100 antlered and 800 antlerless elk. Recent bull harvests have been variable and have ranged from 50-60% yearlings in HD 285 to 20-30% yearlings in HD 150.

The BMWC provides a diversity of non-hunting recreational opportunities associated with elk in the midst of wilderness. Opportunities range from viewing solitary bulls in high alpine avalanche chutes to the massive concentrations of wintering elk on the Sun River and Blackfoot-Clearwater wildlife management areas. The Sun River Preserve allows for easy viewing of elk during the rut.

The Goal

The general goal is to manage elk populations and the recreation resource to provide a variety of experiences in hunting and general enjoyment by the public. Emphasis will be placed on providing mature bull elk in back-country settings.

Indicators and Standards

In order to achieve this goal, the following indicators and standards are offered as a systematic means to that end.

1. Maintain the current distribution of elk over three million acres of occupied habitat.

2. Maintain a minimum of 9,000-11,000 elk within the complex.

3. Maintain an observed late-winter ratio of at least 20-30 bulls per 100 cows.

4. Maintain a minimum observed late-winter ratio of at least one branched-antler bull per spike.

5. Maintain elk harvests distributed in time throughout the hunting season, with a maximum of 40 percent of the total bull harvest occurring the first week of the season.

6. Maintain a bull harvest comprised of at least 60 percent branched-antler bulls, and 15-25 percent of the animals 4.5 years or older.

7. Provide for an annual harvest of at least 1,000 antlered elk and 1,000 antlerless elk.

Management Actions

High priority habitat management actions are natural and prescribed fire on wilderness and non-wilderness public lands, aggressive road and trail management, development of additional walk-in hunting areas, more aggressive pursuit of Bonneville Power Administration (BPA) mitigation efforts in the South Fork of the Flathead, development of cooperative livestock grazing programs, close monitoring of and participation in of oil, gas, and mineral development, and coordination with other wilderness management. Additional new road construction into unroaded lands is discouraged.

If wolves are to be included back into this complex, conservation easements and land acquisition must be pursued on key wintering areas along the East Front of the Rockies, the Blackfoot, Clearwater, and Swan valleys, and the Middle Fork of the Flathead River.

Negotiations and cooperative management programs will be pursued with the Blackfeet Indian tribe to increase elk populations in the Badger-Two Medicine area.

The general hunting season framework, except for the totally Wilderness hunting districts (HDs 150, 151, and 280) will be five weeks long. The total elk population will be maintained at a stable level using a combination of either-sex hunting, special antlerless permits, and A-7 (antlerless-only) licenses. Local sub-populations that cause chronic game damage will be addressed with localized special seasons or additional antlerless permits and A-7 licenses. By increasing antlerless harvest on non-migratory, "problem" elk causing game damage, migratory herds in more remote habitats may increase somewhat without increasing negative impacts to landowners or the winter ranges.

A breakdown of population management actions at the hunting district level is as follows:

Elk will be increased in the Swan (HD 130) under the current any-bull season. Antlerless permits or A-7 licenses will be initiated and increased as the population increases.

Elk numbers will be increased slightly in HD 140 and HD 141 under the current season type. Populations could be regulated with antlerless permits or A-7 licenses, instead of either-sex hunting, to foster populations. Increased habitat security, through recent road closures, should slow the rate of female harvest over what was observed in the 1980s.

The traditional early rifle season in HD 150, 151 and 280 will be continued under current regulations. The population will be closely monitored to determine if it meets stated objectives. Alternatives include a later starting date (ex. October 1) or earlier closing date (ex. November 1) or antler point restrictions. An evaluation of the experimental BTB season in HD 280 will be used to determine success of such seasons in a backcountry area.

In HD 282 and HD 285, elk populations will be held stable using antlerless permits or A-7 licenses during the general season. Bulls will be hunted in HD 285 under existing and new road management programs with cooperating landowners. Hunting in HD 282 during the first three weeks of the general season will be regulated to help keep bulls from seeking refuge in this permit-only district.

Many elk are shared between HD 280, HD 281, and HD 422. Whereas the wintering elk population has grown in HD 422, none of the Elk Management Unit's objectives for bulls are currently being met in any of the districts. As stated above, the experimental BTB season in HD 280 and HD 281 will be evaluated to determine if the objectives can be met. Bulls in HD 281 will be regulated in the general five-week general season, and along with aggressive road management in the Kershaw Mountain and Ovando Mountain areas. In HD 422, where most of the wintering elk summer west of the divide, the management will be aimed at stabilizing this population at 500 animals. The population levels are primarily dictated by landowner tolerance as most of the elk winter on private land. Access to public land is also limited due to landownership patterns and rugged terrain. Liberal either-sex hunting will continue to control this migratory elk herd until winter range is secured by easement, lease, or acquisition, or until hunter access is improved, or the distribution of wintering elk changes. As a result of the 1988 Canyon Creek fire, winter ranges on U.S. Forest Service lands are expected to become more attractive to elk. If this occurs, the hunting regulations will be restricted to accommodate a population increase on public land.

The aim of management in the Sun River is to maintain a wintering population of 2,500 elk. Population numbers will be regulated through the use of harvest quotas. Hunting seasons will be constructed to reduce the bull harvest from current levels with the objective of retaining older aged bulls. This

will require reducing the bull harvest from 50% of the quota to 35-40%. This may be done through restricting the first portion of the season to antlerless-only, followed by either-sex hunting until the quotas are reached.

Quotas for the area will continue to be set based upon the number of animals observed on winter ranges, summer production surveys, forage production on winter ranges, and harvest information from the Augusta Game Check Station. Lesser quota adjustments of up to 100 animals will be made annually based on these parameters. Quotas will be substantially reduced (by 200 or more) if:

(1) 2,200 or fewer wintering animals are observed for three years and adequate forage exists to support more;

(2) if new winter range is secured;

(3) if permanent changes (three years or more) are noted in wintering patterns, or;

(4) if less than 60 percent of the elk forage base produced on the Sun River Wildlife Management Area (SRWMA) is utilized for two consecutive years.

Quotas will be substantially increased (200 or more), if:

(1) utilization of the elk forage base on the SRWMA exceeds 85 percent for a three-year period;

(2) forage production on the SRWMA falls below that required to supply 12,000 elk-months of utilization for two consecutive years;

(3) private lands receive heavy elk depredation, or; (4) calf production falls below 30 calves per 100 cows for three consecutive years.

The elk herd in HD 415, which is at low numbers, continues to increase slowly. This hunting district is mostly inaccessible by vehicle and escape cover is plentiful (except along the perimeters of the Blackfoot Indian Reservation and Glacier National Park). Year-round illegal hunting has been suspected as the factor suppressing population growth for several decades. Stepped up enforcement efforts in addition to improved vehicle management on the Lewis and Clark National Forest portion of the hunting district during the past five years have improved the outlook for this herd.

The elk population will be increased under a hunting season with the first one to two weeks either-sex hunting and the

balance of the season any-bull. More liberal antlerless seasons will be initiated when a wintering population of 500 is reached.

Increased monitoring of elk populations will have to be implemented if oil and gas exploration activities are increased in the Badger-Two Medicine area. Radio-marked animals should be used to assess and monitor displacement effects of exploration activities. Elk wintering in HD 441 are slowly increasing in numbers and will be allowed to approach 500 before a liberal harvest strategy is considered.

The population will be regulated with a five week any-bull hunting season. Elk hunting east of the Bob Marshall Wilderness boundary would be by permit only. Any-bull hunting will be conducted west of the wilderness boundary. This strategy allows a zone of safety for bulls once they reach winter range. The antlerless harvest would be controlled by special permit. The bull harvest in HD 151 greatly effects survival of bulls wintering in HD 441. Continued monitoring may point towards changes in HD 151 regulations if appreciable increases in HD 441 are to be realized.

Monitoring

Forage quantity on MDFWP wildlife management areas will be monitored by replicated permanent transects and plots, and frequent field inspections. Federal agencies will similarly monitor winter ranges under their management.

Geographical Information Systems will be utilized to measure gross habitat conditions such as cover:forage ratios as they become available.

Antler beam and body measurements from harvested elk will be collected at check stations and in the field, and will be used to monitor overall condition of the year-long habitat.

Radio-collared elk will be used as a tool to solve specific habitat management questions or needs as they arise.

The number of trail-heads and new trail development will be monitored. The Forest Service will inventory their road management systems and determine open road densities.

The status of habitat on private lands will be pursued through continued contacts with landowners.

All hunting districts within the Bob Marshall Unit share elk with backcountry districts, and most share some elk with several adjacent districts. Elk that winter, and are subsequently

counted, in one hunting district may be killed in another district. To a great extent, the populations dynamics on winter and spring ranges are a reflection of elk harvests in distant hunting districts. This is especially true when looking at the relationship of the back-country districts to those on the periphery of the complex. Strategies to monitor the indicators and standards should therefore take the approach of examining hunting districts as single pieces (or strata) of a very large and diverse total picture.

Trends in elk numbers and condition as well as hunter harvest information will be combined to monitor the management actions. Estimates for the total Bob Marshall Unit will be derived using each hunting district or surveyed herd unit as a different strata.

Estimates of elk numbers will be derived from annual, late winter/early spring helicopter surveys, on 12 winter herd units. Surveys in the Swan Valley are the only new areas that will be needed above current efforts. The "Idaho Sightability Model" will be used on selected areas to more accurately determine population numbers by sex and age-class. Late-winter flights will be used to sample bull:cow and calf:cow ratios. Summer surveys will be flown in the Sun River area and Scapegoat Wilderness to monitor pre-hunting season population size and calf production. Other areas will be identified and similar surveys developed for those areas as well.

Radio telemetry studies will be used to better define and monitor herd units and their movements. A sample of radioed elk will be maintained in areas of intensive population surveys.

Harvest trends, elk population age structure, animal condition, and antler characteristics will be monitored through five check stations. Permanent check stations will be maintained at Augusta (HDs 424, 425, 427 and 428), Bonner (HDs 130, 280, 281, 285 and 282), Hungry Horse and Martin City (HDs 140 and 150), and Swan Lake (HDs 130, 281, 282 and 285). A voluntary tooth turn-in in the backcountry hunting districts (HDs 150, 151 and 280) will be continued. If sample sizes fall below what is needed, a mandatory check may be instituted. Year-long habitat, and subsequently animal condition, will also be monitored by antler and diastema measurements taken at check stations.

State-wide hunter harvest surveys will be used to monitor total harvests, hunter effort, timing of harvest, and antler-point distributions in hunting districts not covered by check stations. Outfitter reports will be monitored to track outfitter use and harvests in backcountry areas. Statewide harvest data will be calibrated against check station data to monitor its applicability.

Hunter contacts, as well as camp and trail-head checks, will be used to also monitor hunter distribution and numbers.

Cumulative five-year averages will be used to determine the success and failure of management actions. In the case of a generally increasing trend in standards, the existing management actions simply may need more time to achieve the objective.

In case of a failure to demonstrate an increased bull:cow ratio, contingency options include one or more of the following:

1) More aggressive road management and cooperative timber management programs designed at achieving the standards.

2) A five-week general big game season with opening and closing dates moved two weeks earlier. This would be expected to increase bull survival over a several year period by limiting hunting when elk are concentrated on winter range. This is contingent upon acceptance of the early opening and closing dates for surrounding areas to distribute a transfer in hunting pressure.

3) Begin the early rifle season on October 1. This would provide an early hunt outside of the peak of vulnerability during the rut. If this later starting date was enacted, the season's closing date could probably coincide with the general big game season.

4) The antlerless harvest could be regulated with special permits or A-7 licenses, instead of either-sex hunting, to encourage population growth.

5) Shorten the current general elk season to three weeks. This would limit hunting while elk concentrate on winter ranges.

6) Antler point restrictions such as four point or better seasons or allowing only bulls to be taken with branching below the mid-point on the beam. Illegal kills and increased harvest pressure on older bulls are reasons why this is not the preferred alternative. Results of this season type are expected to produce more two-year-old elk, but fewer bulls 4.5 years (six point) or older.

FISHERIES INDICATORS, STANDARDS, AND POTENTIAL MANAGEMENT ACTIONS

The fisheries resource within the BMWC is extensive and unique. More than 500 miles of streams and 35 lakes support populations of native and introduced species of salmonids. Waters within the BMWC represent a genetic stronghold for two native fish species of special concern -- bull trout and westslope cutthroat -- and provide thousands of angler days of recreation.

Statewide creel surveys have estimated that the South Fork Flathead River alone supports from 5,000 to 12,000 angler days each year.

This section of the report describes current fisheries management, biological indicators and standards, and further management actions that may be required to maintain those standards. These actions are consistent with the strategies discussed in the previous section.

SOUTH FORK OF THE FLATHEAD RIVER

General Discussion

The South Fork of the Flathead River and Hungry Horse Reservoir support a high quality fishery for native species. Westslope cutthroat trout and bull trout support the majority of the sport fishery. Fisheries management direction in the drainage has emphasized a quality fishery with restrictive limits, rather than a high-harvest production fishery for those two Species of Special Concern. Large numbers of mountain whitefish inhabit the river and reservoir, but few anglers take advantage of this sport potential and food source.

Since more restrictive regulations were initiated in 1983, the average size of cutthroat in the population has increased in the South Fork Flathead River within the wilderness complex. Catch rates have increased, and density estimates appear to be good for an area noted for its clear, pristine, relatively nutrient-poor water. The current angling limits are three fish

per day, none over 12 inches. This regulation allows cutthroat to reach maturity yet still provides anglers with fish to eat, an important part of the wilderness experience.

MDFWP and a group of concerned citizens have prepared a fisheries management plan for the entire South Fork drainage. The fishery should be managed consistent with this plan, forest plan guidelines, and wilderness principles. Is it?

Indicators and Standards

A monitoring program should be continued to track the response of the fishery to fishing pressure and regulations. Three sections of the South Fork should be included in the monitoring program: the Gordon section in the upper area, the Black Bear section in the lower middle area of the wilderness, and the Harrison section in the South Fork below the wilderness boundary. These three sections have been previously surveyed using the snorkel-Peterson method and would provide a good database for comparative purposes through the years. Also, these sections are representative of the three major fish habitat types found in the South Fork. An annual monitoring program on three sections of the South Fork would be ideal but cost-prohibitive due to the large amount of money and effort needed to survey the South Fork, especially in the wilderness complex. A more realistic option would be to survey a representative reach in the middle section of the South Fork every other year (Black Bear Section), with a survey of all three sections every fifth year. This strategy would reduce costs considerably, yet still enable biologists to detect major differences in cutthroat population numbers, size of fish, and age/growth. Biologists should use the snorkel-Peterson method to estimate cutthroat trout densities.

Is this being done? Can we do it? What will it take?

The headwaters area (including lower Danaher and Youngs Creek and the first 1.5 miles of the South Fork) should be sampled annually as a baseline indicator site. The site has been sampled six consecutive years using the same methods. These data can be used to monitor yearly fluctuations in cutthroat catch rates and size distribution, information important in evaluating effects of angling regulations on the population.

We recommend the following standards for monitoring the health of the South Fork Flathead fishery. If monitoring data shows a 10 percent or more decrease from these standards, acceptable limits of impact are exceeded, and further management actions are required.

Is natural variation greater than 10%?
If so, how can this be affected?

Fish Length and Catch Rate:

(a) Using hook and line capture and a sample size of 300 or more cutthroat, the following standards should be met in the Black Bear section (monitored every other year):

- average length: ≥ 9.0 inches
- percent ≥ 10 inches: 25 percent
- percent ≥ 12 inches: 10 percent

(b) Using hook and line capture and a sample size of 100 or more cutthroat, the following standards should be met in the Headwaters section:

- average length: ≥ 10.0 inches
- percent ≥ 10 inches: 40 percent
- percent ≥ 12 inches: 15 percent

These fish should be caught at a rate exceeding 6.0 fish per hour under good angling conditions.

If annual monitoring data shows a 10 percent or more decrease from these standards, acceptable limits of impact are exceeded, and further management actions are required.

Fish Population Numbers:

Using the snorkel-Peterson method, the following standards should be met in the Black Bear section in alternate years:

- Total cutthroat population: 450 fish per km
- Number > 10 inches: 90 per km
- Number ≥ 12 inches: 40 per km

Creel Card Angler Survey:

Results from periodic angler survey (every second or third year) should indicate greater than 25 percent of cutthroat caught exceed 12 inches (estimated lengths of fish by anglers always exceed MDFWP estimates). Also, catch rates for cutthroat should exceed 2.5 fish per hour.

Age and Growth:

Calculated growth of westslope cutthroat captured in the Black Bear and Headwaters sections should exceed 245 mm (9.6 in) at age IV. Sample size should exceed 50 fish.

Potential Management Actions

If decreases below these standards are noted, agencies should implement further management actions. Potential management actions for the South Fork fishery include:

1. Restrict the use of bait on the South Fork Flathead River.

2. Require barbless hooks, artificial lures only.

3. Reduce the angling bag limit to one or two fish.

4. Implement an educational program on regulations and catch and release techniques.

5. Increase enforcement of regulations through cooperative agency efforts.

6. Regulate the number of float-anglers or total anglers on the river.

7. Impose a catch and release angling regulation on all or a portion of the South Fork within the BMWC.

MIDDLE FORK OF THE FLATHEAD RIVER

General Discussion

The major sport fish (numerically) in the Middle Fork Flathead River and its tributaries within the BMWC is the westslope cutthroat. Westslope cutthroat are a species of special concern, and have been shown to be highly susceptible to angler harvest. Therefore, we recommend maintaining the current stream fishery limits of three fish, none over 12 inches (305 mm) in the Middle Fork drainage within the BMWC.

Cutthroat trout inhabit all of the 12 mountain lakes in the Middle Fork drainage within the BMWC. Six of these lakes are planted with cutthroat regularly; in six of the lakes, populations are maintained through natural reproduction. The present lake fishing limit of three fish, no size restrictions, appears to allow for a reasonable harvest while maintaining an adequate population size. Almeda and Dickey lakes harbor pure westslope cutthroat from the new brood stock. These lakes are difficult to access because of primitive trail conditions. To

protect these stocks and provide a varied angling experience, trail maintenance into this area should be halted.

Bull trout provide an important trophy fishery in the Middle Fork Flathead River and some of its tributaries (e.g., Schafer and Dolly Varden creeks). Anglers are willing to expend eight hours or more to catch a single mature bull trout. Based on our spawning site surveys, the number of bull trout spawning sites (redds) in the drainage has been relatively stable. Apparently, the current fishing limit of one fish daily and in possession is affording adequate protection for the spawning adults.

The Middle Fork drainage is unique within the BMWC in that the upper portions of certain tributary drainages are undergoing timber harvest near the BMWC boundary. Stream habitat degradation from this activity is extending down-stream within the BMWC. Man-caused habitat degradation is contrary to the concept of wilderness protection, and should be discontinued. Therefore, we recommend no further road construction, timber harvest, or other activities that cause pollution in tributaries that flow into the BMWC. To be consistent with the wilderness act, which the U.S. Forest Service administers, timber and road activities should be halted and no further work planned in the following drain-ages: Morrison, Granite (includes Challenge and Dodge) and Twenty-five Mile.

Trail construction improvements and location also could have a negative impact on the fishery in the Middle Fork drainage within the BMWC. Trail locations should be examined carefully along tributary reaches important for bull trout spawning (see maps in Appendix Report), where large, mature bull trout spawners are vulnerable and very sensitive to disturbance. Specifically, Trail Creek supports a large number of bull trout spawners, and the existing trail has a history of limited maintenance. To reduce access and disturbance to this concentrated spawning area, we recommend halting all trail maintenance in the drainage.

Increased access to westslope cutthroat rearing areas could encourage overharvest of fish in important nursery areas. Basin Creek (above its junction with Bowl Creek) is a critical rearing area for cutthroat and the trail along its length has a history of low maintenance. To reduce access to this cutthroat rearing area, we recommend discontinuing all trail maintenance in the Basin Creek drainage above Bowl Creek.

Indicators and Standards

We recommend the following standards for monitoring the health of the Middle Fork fishery. If monitoring data shows a 10 percent or more decrease from these standards, acceptable limits

of impact are exceeded and further management actions are required.

Cutthroat Population Numbers:

Using the snorkel-Peterson method, the following standards should be met in the Gooseberry section (Gooseberry Cabin to Clack Creek) in alternate years:

- Total cutthroat population: 250 fish

These numbers may have to be adjusted as more estimates are completed in normal water years.

Cutthroat Length and Catch Rate:

Using hook and line capture and a sample size of 75 or more cutthroat, the following standards should be met in the Gooseberry section:

- Average length: ≥ 8.0 inches
- Catch rate: ≥ 3 fish per hour under good conditions
- Percent ≥ 10 inches: 10 percent

Creel Card Angler Survey:

Results from periodic angler surveys (every second or third year) should indicate greater than 10 percent of cutthroat caught exceed 12 inches (estimated lengths of fish by anglers always exceed MDFWP estimates). Catch rates of cutthroat trout should exceed 0.8 fish per hour.

Bull Trout Spawning Sites:

Bull trout populations are very sensitive to disturbance both within and outside the BMWC boundary. Bull trout which spawn in the Middle Fork drainage within the BMWC migrate a minimum of 150 km. They are exposed to angling in Flathead Lake and in the Flathead River system along the length of their migration route. To monitor spawning success, bull trout redds should be counted each year in selected tributaries within the BMWC (Table 44). Trends in the number of redds in each tributary should be closely followed and compared to counts outside the BMWC in other portions of the Flathead Basin. Counts should be no less than 20 percent below the average figure for the drainage. What do past fluctuations look like?

some question whether this can continue?

MDFWP should continue to measure streambed conditions on Granite Creek just upstream of the wilderness boundary to monitor sediment pollution entering the BMWC from timber activities upstream. Sediment conditions in this reach (44 percent fine

sediments in the streambed in 1987) are among the highest measured in the entire Flathead drainage.

Do we want to electrofish all trout? ; WSCT

Electrofishing estimates of juvenile bull trout and cutthroat trout in Morrison and Challenge creeks outside the wilderness boundary should be continued as they reflect population levels of progeny of adult fish which migrated upstream from the BMWC to spawn.

Mountain Lakes:

To build a better data base for managing cutthroat in mountain lakes in the drainage, we recommend a survey of two lakes per year by gill net and/or hook and line for size, genetics, and age/growth determination. Initially, we recommend survey of Stanton Lake and Tranquil Lakes (2). Stanton is an easy-access lake (1.5 miles, trail) with relatively heavy fishing pressure and small cutthroat. The Tranquil Lakes are difficult to reach, support lighter fishing pressure, and contain larger cutthroat. Cutthroat populations are maintained naturally in both Stanton and the Tranquil Lakes, but genetic make up of the fish is unknown. If funds are available, it would be desirable to collect fish from the two lakes for genetic testing. The remaining nine lakes in the drainage with fish populations could be surveyed as funds allowed, preferably two lakes per year.

Table 44. Bull trout redd counts for selected areas of tributaries chosen for monitoring in the Middle Fork Flathead drainage.

	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	Mean
Granite[a]	25.[b]	75	32.[b]	86	67	38	99	52	49	50	63	58
Lodgepole	14	34	14.[b]	34	31	47	24	37	34	32	31	30
Schafer	15	10	12	17	18	--	--	30	30	14	15	18
Dolly V.	20	21	31	36	53	--	--	42	51	46	56	40
Ole[c]	--	19	19	51	35	26	30	36	45	59	21	34
Mean Total												205

[a] Portions of the section counted are outside the BMWC.
[b] Incomplete survey, counts probably low.
[c] Glacier National Park

Potential Management Actions

If decreases below these standards are noted, agencies should implement further management actions. Potential management actions for westslope cutthroat are included under the South Fork section. If declines are detected in the number of bull trout spawning in the drainage steps should be taken to increase protection of the spawning run. Options for increased protection include:

(1) Restrict angling on Dolly Varden and Schafer creeks. These streams are important for bull trout spawning and are easily reached across from Schafer Meadows Guard Station (which is accessible by air).

(2) Restrict angling on all major spawning streams within the BMWC (Dolly Varden, Schafer, Clack, Strawberry, Bowl and Trail). Granite, Morrison, Long and Charlie creeks are already closed to angling.

(3) Restrict the season length for bull trout fishing in the river and/or tributaries.

(4) Close the river and/or tributaries to all taking of bull trout.

Adequate enforcement of angling regulations is difficult in the Middle Fork drainage within the BMWC. However, there are several steps which could be taken to improve compliance. First, prominent signs summarizing current regulations should be maintained at all trailheads. Second, personnel of the MDFWP and USFS could increase the frequency of joint enforcement patrols. Finally, a system similar to TIPMONT could be encouraged within the BMWC to reduce the illegal harvest of bull trout from streams in which they spawn. "Snagging" of bull trout in shallow spawning streams was the illegal fishing activity most frequently heard by biologists working in the drainage within the BMWC.

Blackfoot River

The Blackfoot River drainage waters have received a significant number of cutthroat fish plants of unknown genetic make-up. We recommend that fish surveys in these drainages should include genetic evaluations to determine if the native westslope cutthroat trout stocks have been altered and how much.

The greatest need in the Blackfoot drainage is a biological database from which informed management decisions can be made. We recommend a three to five year baseline study with a full-time

funding? priorities?

three-person crew (a biologist and two technicians) and adequate equipment and travel. No monitoring standards can be proposed at this time because of insufficient information.

To begin building a fisheries database for management decisions, we suggest a cooperative effort between FWP Regions 1 and 2 to sample a 1.5-km section of the North Fork Blackfoot River within the BMWC. This sampling would include hook-and-line methods to tag fish and collect scales for age and growth, followed by a snorkel survey to estimate cutthroat population densities.

Other options include: (1) no further improvements on the Bighorn Lake trail, to protect the naturally reproducing cutthroat population there, (2) no trail construction to access Little Crystal lakes, and (3) planting Little Crystal lakes with westslope cutthroat trout.

EAST FRONT DRAINAGES

General Discussion

Streams draining the East Front within the BMWC support an important fishery for rainbow, cutthroat and eastern brook trout. Lack of information on the fishery limits the effective management of this resource. We recommend a three year baseline study on fisheries and stream habitat on the East Front drainages within the BMWC to collect information necessary for building a database for sound management. The genetic purity of cutthroat populations within the drainages is unknown. We recommend genetic testing in North and South Fork Sun River Drainage tributaries where cutthroat populations exist, and in the Teton River, Birch Creek, Dupuyer Creek and Dearborn River drainages.

Indicators and Standards

Rainbow and cutthroat population numbers:

Using the snorkel-Peterson method, the following standards should be met in the South Fork of the Sun River from Windfall Creek to Bear Creek (1.06 miles).

- Total rainbow and cutthroat population: 900 fish

Rainbow and cutthroat lengths and catch rates:

Using hook and line capture, and a sample of 100 or more fish, the following standards should be met in the South Fork Sun River:

- Average length: ≥ 11 inches
- Percent ≥12": 30 percent

On the North Fork Sun River:

- Average length: ≥ 10 inches
- Percent ≥12": 20 percent

Creel Card Angler Survey:

Results from periodic angler survey (every second or third year) should indicate greater than 20 percent of trout caught exceed 12"; rainbow trout should be caught at rates exceeding 2.0 fish per hour.

Potential Management Actions

If decreases of 10 percent or more below these standards are noted, potential management actions listed under the South Fork section could be implemented. However, agencies could consider actually increasing limits on rainbow trout in the drainage to encourage recreation on this non-native species.

Overall Fishery Management Recommendations

Presently, fisheries management within the BMWC is based on general guidelines agreed upon in 1979 by the MDFWP director and the regional forester for Region 1, USFS. Fisheries managers in MDFWP Regions 1, 2 and 4 cooperate with district rangers to formulate local management actions. MDFWP and USFS will reexamine the memorandum of understanding between the two agencies, and update the document in light of new information and the results of this L.A.C. process. Strategies should be clarified and reaffirmed for the following:

This may be nearing completion already

1. Techniques of fish population sampling (rotenone, motorized electrofishing).

2. Chemical rehabilitation of lakes.

3. Fish planting (native vs. non-native species, endangered or threatened species, barren lakes, aerial planting).

4. Cooperative fish population monitoring.

5. Angling/recreation philosophy (harvest vs. population maintenance, angling and floating restrictions, angler access).

6. Habitat protection (trail construction within the BMWC, land use outside the BMWC that affects waters within the BMWC).

7. Management of fish species such as cutthroat and bull trout which migrate into and out of the BMWC.

8. Enforcement of angling regulations.

9. Consideration of a cooperative fisheries biologist position for the BMWC.

The valuable fisheries resource within the BMWC will be benefitted by comprehensive, consistent fisheries management that recognizes the balance between maintaining the integrity of fish populations and providing angling recreation. Management should be consistent with existing fisheries management plans (i.e., South Fork Flathead). We recommend formation of a fisheries management committee for the BMWC which would consist of the MDFWP fisheries managers, representatives of the four national forests within the BMWC, and designated public participants. This committee could formulate a detailed management plan, and recommend adaptive fisheries management policies for review by the MDFWP Director and regional forester.

CONCLUDING COMMENTS

This plan for the fish and wildlife of the BMWC ecosystem is offered to the Montana Department of Fish, Wildlife and Parks (MDFWP) and the United States Forest Service (USFS) for implementation. The plan is, to a substantial extent, the perspective of its authors. The plan put forward has been molded by comment, suggestion and criticism offered by the many participants of the LAC Task Force and the Fish and Wildlife Committee of that group. These contributions have been very valuable, and as a result, this report is the product of the MDFWP, citizen volunteers, and USFS personnel.

In essence everyone working on this project was a volunteer, completing this job in addition to other full time assignments. The sole motivation was a common concern for the Wilderness resource and the fish and wildlife dependent upon it.

Implementation

This plan is now remanded to David Jolly, Regional Forester of the Northern Region, USFS, and K. L. Cool, Director of the MDFWP for consideration and implementation as part of the work of the Bob Marshall Wilderness LAC Task Force.

It is recommended that this plan be implemented through the execution of a Memorandum of Understanding (MOU) between the principle management agencies, the USFS and the MDFWP.

It is further recommended that the MOU provide for the creation of three interagency plan implementation entities. These entities would be a Wilderness Management Policy Committee, a Technical Committee, and a Bob Marshall Wilderness Management Coordinator in each agency.

It is finally recommended that the above-named groups, working within the framework of a MOU, continue to work within the framework of the LAC process to assure public access to the Wilderness management agencies.

James A. Posewitz

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APPENDICES

Appendix 1. Descriptions of forest management area prescriptions according to the following categories: Wilderness, Proposed Wilderness, Unroaded, Low-Moderate Access, and Developed-Timber.

No.	Name	Forest[1]	Roads	Description
WILDERNESS PRESCRIPTIONS				
P	Classified Wilderness	L&CNF	Roadless	Bob Marshall and Scapegoat Wildernesses; grazing is allowed, withdrawn from mineral activity.
P-1	Wilderness	HNF	Roadless	Scapegoat Wilderness; 34% managed by Lincoln Ranger District; grazing is all owned, withdrawn from mineral activity.
12	Wilderness	LNF	Roadless	Bob Marshall and Scapegoat Wildernesses; grazing is allowed; withdrawn from mineral activity.
18	Wild & Scenic River	FNF	Roadless in Wild segment; in Recreational and Scenic Segment, designed to enhance river values.	Flathead River; pack stock grazing only; no timber harvest; mineral leasing withdrawal; in Wild Segment no motorboats, in Recreational and Scenic segment, no boats exceeding 10 horsepower will be allowed.
21	Wilderness	FNF	Roadless	Great Bear and Bob Marshall Wilderness areas; allowed; withdrawn from mineral activity.
PROPOSED WILDERNESS PRESCRIPTIONS				
Q	East Slope Recommended Wilderness	L&CNF	All areas and trails open to trail vehicles and snow machines, except where restricted.	Manage to protect wilderness values.
N	RARE II	L&CNF	Minimize access; limit motorized use to existing roads. No construction for surface resources; for subsurface resources roads will be closed to public.	Deep Creek Reservoir North; further planning area pending oil and gas decisions; grazing is allowed.
12	Proposed Wilderness	LNF	Roadless	Same prescription number as Wilderness; timber harvest not permitted; grazing is allowed.
-	Proposed Wilderness	FNF	No motorized access except for administrative purposes to microwave repeater.	Shaded area on management area map. Area 19 Jewel Hiking Area; no surface occupancy for minerals; helicopter access allowed.

Appendix 1. (cont'd.)

No.	Name	Forest[1]	Roads	Description
UNROADED PRESCRIPTIONS				
N-1	Research Natural Areas	HNF	No Construction.	Timber harvest and livestock grazing, will not be allowed; areas for research, observation and study.
8	Timberland/Roadless	FNF	Roads constructed for temporary support of aerial harvest or mineral access.	Timber harvest scheduled; pleasing natural appearance.
R-1	Primitive and Semi-Primitive Recreation	HNF	Roads will not be constructed except to access mineral activity on private land; roads exist but motorized access not allowed.	Unsuitable for timber management; grazing is allowed and range improvements may be implemented (salt; water developments).
LOW-MODERATE ACCESS PRESCRIPTIONS				
E	Big Game Winter Range/ Livestock	L&CNF	Local roads may remain open; low access (0.5-1.5 mi/mi^2) will be maintained. New roads will be allowed only for minerals. Some seasonal closures.	Harvest unprogrammed timber; maintain grazing.
F	Semi-primitive Recreation	L&CNF	Existing roads maintained.	Unprogrammed timber. Existing range use; maintain as is. Undeveloped land with limited motorized access. Semi-primitive recreation.
G		L&CNF	Motorized access limited to designated roads and trails; no new roads unless for minerals; these will be reclaimed.	Harvest unprogrammed timber using existing roads only; existing range use; existing condition.
O	Commercial Forest	L&CNF	Limit motorized access to existing roads and trails. New roads will be closed to the public.	Low intensity timber production at 0.5 million board-feet per year/moderate grazing.
I	Wildlife Habitat	L&CNF	0.5-1.5 mi road/mi^2. Roads built only for mineral activity.	Harvest unprogrammed timber; maintain existing range permits.
M-1		HNF	Roads allowed for minerals, special uses, and access to other management areas. Maintain existing roads.	Salvage and firewood timber harvest. Unsuitable for timber management. Maintain present condition with minimal investment.

Appendix 1. (cont'd.)

No.	Name	Forest[1]	Roads	Description
L-1	Grazing	HNF	Motorized recreation allowed.	Timber harvest may be used to improve forage production; unsuitable for timber production. Vacant allotments will be restocked if in demand.
L-2	Grazing/Wildlife	HNF	Motorized access limited to designated routes.	Livestock grazing maintained; timber harvest may my used to improve forage production; unsuitable for timber management.
W-1	Wildlife	HNF	Road management.	Variety of wildlife habitat; timber harvest only to enhance wildlife values.
1	Nonforest/Noncommercial	LNF	Roads exist; some travel restrictions; construction for access to adjacent areas may occur or for mineral activity.	Scattered parcels; unsuitable for timber harvest but salvage and firewood harvest may occur; grazing permitted; maintain wildlife habitat.
10		LNF	Unroaded; roads permitted for mineral activity if need is proven, public use may be restricted.	Small unroaded parcels; severe physical constraints; unsuitable for timber; maintain natural condition; livestock grazing permitted.
11	Dispersed Recreation	LNF	No motorized access except for mineral activity; some roads exist.	Dispersed recreation; unsuitable for timber harvest; grazing allowed.
13	Riparian/Water Quality	LNF	Roads exist; new road construction will be limited.	Timber harvest scheduled; occasional pack stock grazing; enhance fish and aquatic habitat, wildlife, water quality or recreational.
14	Riparian/Grazing	LNF	Numerous roads exist; new construction will be constrained.	Timber harvest scheduled on portion of area; grazing is allowed in some areas.
19	Wildlife	LNF	Roads will not be constructed for surface management activities but may pass through to access other management areas.	Unsuitable for timber harvest; grazing is allowed if compatible with wildlife.
20	Grizzly/Timber	LNF	Few roads will be left open to public use; new roads will be closed.	Timber harvest scheduled; livestock grazing allowed.
20a	Grizzly/Nontimber	LNF	Seasonal road closures; road construction to access other areas or for mineral activity.	Optimize grizzly habitat conditions; timber harvest only for habitat improvement and safety hazards; unsuitable for timber harvest.

Appendix 1. (cont'd.)

No.	Name	Forest[1]	Roads	Description
27	Commercial Forest	LNF	Roads may pass through to access other areas or for mineral development.	Difficult to harvest, therefore timber considered unsuitable; livestock grazing may occur but will be incidental; no management activities increase wildlife use.
1		FNF	Construction allowed to meet adjacent management area objectives.	Maintain present conditions; minimal investment.
2, 2A 2B	Primitive & Semi-primitive Rec.	FNF	Some motorized, some unroaded.	Six subprescriptions to provide variety of primitive and semi-primitive recreation; existing facilities will be maintained; timber salvage and firewood but timber harvest will not be scheduled; existing grazing maintained; no surface mineral occupancy.
3		FNF	Roads exist; mineral roads will be closed to public.	
11, 11A	Grizzly Habitat	FNF	Control public access; new roads will be local, low standard.	Six subprescriptions to maintain or improve grizzly habitat, maintain existing facilities, including certain campgrounds; grazing is not allowed; timber harvest varies from scheduled to unscheduled.
12	Riparian	FNF	Roads exist; new roads constructed with limitations.	Enhance riparian vegetation and wildlife diversity; unscheduled timber harvest may occur if compatible with riparian goals; grazing is allowed.
13, 13A, 13D	Timberland/Wildlife	FNF	Roads constructed if compatible with wildlife; seasonal closures.	Suitable (13) and unsuitable (13A, 13D) timber; and unscheduled harvest will occur; grazing allowed.
DEVELOPED-TIMBER PRESCRIPTIONS				
H	Developed Recreation/ Livestock	L&CNF	Achieve high public access. (+3.0 mi. of open road/mi^2).	Campgrounds, ski areas, recreation residences, some livestock grazing, harvest unprogrammed timber. Create new recreation sites or expand existing sites.
2	Administrative Sites	LNF	Roads will be constructed.	Ranger stations, work centers, lookouts; grazing is allowed; administrative timber removal.

Appendix 1. (cont'd.)

No.	Name	Forest[1]	Roads	Description
9	Recreation Areas	LNF	Extensive road system in place.	Concentrated public use; near population centers, streams or lakes; recreation is encouraged; unsuitable for timber harvest.
16	Timber	LNF	Extensive road system in place and will be further developed.	Timber harvest scheduled; grazing may be
17	Timber	LNF	Extensive road system in place; average density of 1.5 mi/mi^2.	Timber harvest scheduled; grazing may be allowed.
24	Visual/timber	LNF	Extensive road system; densities vary from 4.6 mi to 2.8 mi/mi^2.	Timber harvest scheduled.
25	Visual/Partial Retention	LNF	Extensive roads system.	Timber harvest scheduled.
5	Roaded Timberlands	FNF	Roads will be constructed.	Maintain natural landscape; scheduled timber harvest.
7	Roaded Timberlands	FNF	Roads will be constructed.	Two subprescriptions; timber harvest scheduled; maintain a pleasing natural landscape.
9, 9B	Timberlands/Deer Winter Habitat	FNF	Seasonal closures; road construction or reconstruction if compatible with white-tailed deer.	Timber harvest scheduled and grazing allowed on management area 9; timber harvest not scheduled and grazing not allowed on 9B.
11C	Timberlands/Grizzly Habitat	FNF	New roads will be local, low standard; seasonal closures.	Timber harvest scheduled; grazing allowed.
13	Timberland/Wildlife	FNF	Seasonal closures; road construction and reconstruction if compatible with deer and elk.	Five subprescriptions; 13 and 13C suitable for timber harvest and will be scheduled; grazing allowed in 4 areas and not allowed in 1.
15	Timberlands	FNF	Some motorized restrictions; roads will be constructed.	Six subprescription; emphasize timber; livestock grazing allowed.
16	Timberlands	FNF	Roads for timber may be constructed, otherwise support roads for aerial harvest will be temporary.	Four subprescriptions; emphasize timber except on 678 acres of proposed wilderness; no permitted livestock grazing.

Appendix 1. (cont'd.)

No.	Name	Forest[1]	Roads	Description
17	Riparian/Timber	FNF	Roads will be constructed.	Timber harvest scheduled; grazing allowed.
T-1	Timber	HNF	Constructed as needed.	Timber production; grazing maintained.
T-2	Timber/Wildlife	HNF	Road management constructed as needed.	Timber production, grazing maintained.
T-3	Timber/Wildlife	HNF	Constructed as needed.	Timber production compatible with wildlife; grazing maintained.
T-4	Timber/Visual	HNF	Road management, constructed as needed.	Timber production; grazing maintained.

[1/]Forest abbreviations:
L&CNF = Lewis and Clark National Forest
HNF = Helena National Forest
LNF = Lolo National Forest
FNF = Flathead National Forest

SUMMARY OF APPENDIX 1

Combinations of U.S. Forest Service management area prescriptions used in the 1986 Forest Plans to quantify land use activity on four forests within the BMWC ecosystem.

	National Forests			
	Flathead	Lolo	Helena	Lewis & Clark
Wilderness (W)	18[1/] 21	12	P-1	P
Proposed Wilderness (P) or RARE II areas	19	12		Q N
Unroaded (U)	8		R-1 N-1	
Low - Moderate Access (L)	1 2 12 2A 13A 2B 13D 3 10 11 11A	1 27 10 11 13 14 19 20 20a	M-1 L-1 L-2 W-1	E F G O I
Developed - Timber (T)	5 17 7 9 11C 13 15 15E 16	2 9 16 17 24 25	T-1 T-2 T-3 T-4	H

[1/] All management prescriptions are from 1986 Forest Plans.

Appendix 2. Land ownership and USFS land management on elk winter ranges within the BMWC ecosystem.

LEWIS & CLARK		TOTAL	LAND OWNERSHIP						FS MANAGEMENT				
			FS	PRVT	CORP	STATE	BLM	BLKFT	WLDRNS	P.WLDR	U	M	TD
ID.	NAME												
1	Badger Two-Medicine	21,952	17,984	1,664	-	-	-	2,304	-	-		17,984	-
2	Badger	8,448	8,256	-	-	-	-	192	-	-	2,890	5,366	-
3	Lookout R	3,328	2,880	-	-	-	-	448	-	-	1,296	1,584	-
4	Blackleaf-Scoffin	73,536	13,952	44,352	-	10,688	4,544	-	2,432	-	-	11,520	-
5	Teton-Twin Lakes	2,368	-	1,856	-	512	-	-	-	-	-	-	-
6	NF Sun	22,592	19,904	1,856	-	64	768	-	8,256	6,784	2,560	1,152	1,152
7	Deadman	192	192	-	-	-	-	-	192	-	-	-	-
8	Pretty Prairie	3,328	3,328	-	-	-	-	-	3,328	-	-	-	-
9	Sun RGR-Ford Cr	54,144	16,832	16,832	-	19,136	1,344	-	-	-	-	16,128	704
10	Haystack	4,608	-	3,520	-	1,088	-	-	-	-	-	-	-
11	Harrison Ridge	5,824	-	5,120	-	448	256	-	-	-	-	-	-
12	Cuniff Basin	1,344	576	448	-	320	-	-	-	-	-	576	-
13	Wrangle Cr.	2,240	-	2,240	-	-	-	-	-	-	-	-	-
14	Falls Cr. Ridge	1,856	1,344	512	-	-	-	-	-	-	-	1,344	-
TOTAL		205,760	85,248	78,400	-	32,256	6,912	2,944	14,208	6,784	6,746	55,654	1,856

Appendix 2. (continued)

HELENA		TOTAL	LAND OWNERSHIP						FS MANAGEMENT				
			FS	PRVT	CORP	STATE	BLM	BLKFT	WLDRNS	P.WLDR	U	M	TD
ID.	NAME												
15	Sunrise-Sunset	13,632	3,200	9,280	-	640	512	-	-	-	-	3,200	-
16	Alice Cr	256	256	-	-	-	-	-	-	-	-	256	-
17	Cool Cr	960	-	192	256	512	-	-	-	-	-	-	-
18	Theodore	2,624	320	576	768	960	-	-	-	-	-	-	320
19	Marcum-Long	1,612	102	422	486	-	602	-	-	-	-	-	102
TOTAL		19,084	3,878	10,470	1,510	2,112	1,114	-	-	-	-	3,456	422
LOLO													
19	Marcum-Long	6,452	410	1,690	1,946	-	2,406	-	-	-	-	-	410
20	Ovando Mtn.	9,152	128	1,152	4,288	3,584	-	-	-	-	-	-	128
21	Blackfoot-Clearwater	22,016	-	3,904	10,816	7,296	-	-	-	-	-	-	-
22	Danahur-Dry FK	1,702	1,702	-	-	-	-	-	1,702	-	-	-	-
TOTAL		39,322	2,240	6,746	17,050	10,880	2,406	-	1,702	-	-	-	538

Appendix 2. (continued)

FLATHEAD		TOTAL	LAND OWNERSHIP						FS MANAGEMENT				
			FS	PRVT	CORP	STATE	BLM (GNP)	BLKFT	WLDRNS	P.WLDR	U	M	TD
ID.	NAME												
22	Danahur Mtn - Dry Fork	6,810	6,810	-	-	-	-	-	6,810	-	-	-	-
23	Hahn Cr	5,184	5,184	-	-	-	-	-	5,184	-	-	-	-
24	Danahur Basin	2,944	2,944	-	-	-	-	-	2,944	-	-	-	-
25	Black Bear Gordon Cr	34,880	34,880	-	-	-	-	-	34,880	-	-	-	-
26	Picture Rdg	4,160	4,160	-	-	-	-	-	4,160	-	-	-	-
27	Bunker Cr	5,632	5,632	-	-	-	-	-	-	-	-	4,672	960
28	Soup Cr - Condon	33,408	10,816	1,600	13,696	7,296	-	-	-	640	-	832	9,344
29	Swan-Lost Cr	3,456	3,072	-	-	384	-	-	-	-	-	640	2,432
30	Swan Lk-Sixmile	3,200	704	1,216	896	384	-	-	-	-	-	-	704
31	Sullivan Cr	2,624	2,624	-	-	-	-	-	-	-	-	640	1,984
32	Dry Park Big Bill Meadow Cr	42,240	42,240	-	-	-	-	-	2,560	-	-	11,840	27,840
33	Cable Mtn	1,280	1,280	-	-	-	-	-	1,280	-	-	-	-
34	Winter	6,144	6,144	-	-	-	-	-	6,144	-	-	-	-
35	Schaffer Md	1,088	1,088	-	-	-	-	-	1,088	-	-	-	-

Appendix 2. (continued)

FLATHEAD		TOTAL	LAND OWNERSHIP						FS MANAGEMENT				
			FS	PRVT	CORP	STATE	(GNP)	BLKFT	WLDRNS	P.WLDR	U	M	TD
ID.	NAME												
36	Patrol Rdg	2,688	2,688	-	-	-	-	-	2,688	-	-	-	-
37	Bradley Mtn	4,032	4,032	-	-	-	-	-	4,032	-	-	-	-
38	Spruce Cr	1,216	1,216	-	-	-	-	-	1,216	-	-	-	-
39	GNP Bear Cr	4,288	-	-	-	-	(4,288)	-	-	-	-	-	-
40	GNP Nyak	8,000	448	256	-	-	(7,296)	-	-	-	448	-	-
41	Firefighter	10,688	10,688	-	-	-	-	-	320	-	-	896	9,472
TOTAL		183,962	146,650	3,072	14,592	8,064	(11,584)	-	73,806	640	448	19,520	52,736

Appendix 3. Elk hunting regulations for hunting districts within the BMWC ecosystem, 1964 - 1986.

	1964	1969	1974	1979	1984	1986
130	HD13 Arch5[1] ES5 10[2]	HD13 ES3 AB 5	ES3 AB 5	ES1 AB 5	ES1 AB 5	ES1 AB 5
140	HD14 ES5 5	HD14 ES3 5 AB	ES3 AB 5	ES1 AB 5 AP1	ESP1 AB 5 ES1	ES1 AP1 5 AB
141	See 140 (14)	See 140 (14)	See 140	ES1 AB 5	ES1 AB 5	ES1 AB 5
150	HD15 ES6 6	HD15 ES8 10 AB	ES8 AB 10	ES4 AB 10	ES2 AB 10	ES2 AB 10
151	See 150 (15)	See 150 (15)	See 150	See 150	ES2 AB 10	ES2 AB 10
280	ES10 10	ES8 AB 11	ES8 AB 10	ES½ AB 10	AB AP5 10	BAB AP5 10
281	ES5 5	ES3 AB 6	ES2 AB 5	AB ES3 5	AB AP5 5	BAB AP5 5
282	See 285 (28)	ES2 2	ESP1½ 1½	ESP1 1	ESP2	ESP2
284	See 281	See 281	See 281	ES½ AB 5	ArchAB 5	ArchAB 5
285	HD28 ES5 5	HD28 ES3 AB 6	HD283 ES1½ AB 5	HD283 ES½ AB 5	HD283 AP5 5	AP5 AB 5
415	HD41-01-02 ES1 AB 5	ES2 AB 6	ES2 AB 5	ES1 AB 5	ES2 AB 5	ES1 AB 5
422	ES2 AB 5	ES5 5	ES5 5	ES5 5	ES5 5	ES5 5
424	See 422	HD422 ES6 6	ESQ AB 5	ESQ AB 5	ESQ AB 5	ESQ BAB 5

Appendix 3. Continued

425	HD42-01-02 -03 ESQ AB 5	ESQ AB 1	ES1 1	ESQ AB 5	ES2 2	AP2 Ant1 2
427	See 442 (42)	See 442 (42)	See 442 (42)	ESQ 5	ESQ AB 5	ESQ 5
428	See 425 (42)	See 442 (42)	See 424 (42)	ESQ 5	ESQ AB 5	ESQ 5
441	See 415 (41)	HD41 ES1 AB 6	ES1 AB 5	ES1 AB 4	ES2 AB 5	AP5 AB 5
442	See 425 (42)	HD42 ESQ AB 6	ESQ AB 5	ESQ AB 5	ESQ AB 5	ESQ BAB 5

HD = hunting district (recent HD number may be different from earlier number, due to division of early HD)
Arch = archery only
Q = quota
ES = either sex
ESP = either sex permit
AP = antlerless permit
ANT = antlerless elk
AB = antlered bull
BAB = branched antlered bull

[1]Arch5 = number next to hunting season code indicates season length for that code in weeks
[2]10 = total season length in weeks

Appendix 4. Elk harvest and composition, and numbers of hunters in the total BMWC elk ecosystem.

Total BMWC

YEAR	TOTAL	BAB[2]	SPIKE	COW	CALF	UNK	HUNTERS
1966	2358	824	416	896	211	11	9705
1967	2362	791	390	852	329	0	12,759
1968	2302	739	272	938	321	32	13,869
1969	1918	581	254	797	278	8	11,342
1970	2545	972	372	637	258	6	11,848
1971	2022	810	348	592	231	41	15,718
1972	2012	696	298	703	260	55	18,484
1973	2618	824	403	933	314	144	20,123
1974	1630	598	232	394	185	221	20,349
1975	2205	697	365	769	236	138	20,612
1976	1270	542	145	434	84	65	17,157
1977	1741	732	312	455	169	73	17,497
1978	1413	553	259	404	149	48	17,613
1979	1027	430	149	332	87	29	15,060
1980	1512	545	362	462	116	27	15,308
1981	1358	477	339	445	92	5	12,841
1982	1459	634	351	392	67	15	11,479
1983	1178	477	337	295	68	1	11,281
1984	2208	727	568	714	195	4	11,959
1985	1788	634	389	594	170	1	11,933

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[1] Hunting districts: 130, 140, 141, 150, 151 (Hunter questionnaire data)

[2] BAB: Branch-antlered Bull

Appendix 5. Elk harvest and composition, and numbers of hunters in Region 1 of the BMWC elk ecosystem. (Hunter questionnaire data.)

Region 1 of BMWC (Flathead)[1]

YEAR	TOTAL	BAB[2]	SPIKE	COW	CALF	UNK	HUNTERS
1964	1039	375	150	398	112	4	5422
1965	789	240	72	317	148	12	3878
1966	1529	516	273	570	159	11	5162
1967	1125	385	209	373	158	0	5708
1968	1284	374	146	625	132	7	6980
1969	892	217	190	390	87	8	5441
1970	938	528	141	181	82	6	5301
1971	1148	512	199	282	131	24	7566
1972	875	386	126	240	101	22	7404
1973	1359	471	241	470	122	55	9616
1974	949	390	170	193	97	99	10074
1975	1193	399	190	398	114	92	10320
1976	872	397	79	299	56	41	9088
1977	1082	534	162	263	98	25	9206
1978	777	308	115	235	88	31	9228
1979	680	291	105	207	59	18	8490
1980	794	307	136	271	63	17	8530
1981	716	294	194	181	47	-	6481
1982	759	379	149	186	37	8	6531
1983	698	302	206	157	33	-	6140
1984	950	388	281	199	82	-	5017
1985	673	357	124	144	48	-	5187

[1] Hunting districts: 130, 140, 141, 150, 151 (Hunter questionnaire data)

[2] BAB: Branch-antlered Bull

Appendix 6. Elk harvest and composition, and numbers of hunters in Region 2 of the BMWC elk ecosystem.

Region 2 of BMWC (Blackfoot-Clearwater)[1]

YEAR	TOTAL	BAB	SPIKE	COW	CALF	UNK	HUNTERS
1966	217	103	11	84	19	0	1289
1967	336	89	62	144	41	0	1647
1968	342	127	44	126	34	11	2414
1969	367	190	0	137	40	0	1927
1970	275	157	53	45	19	0	1677
1971	203	99	51	46	4	3	2529
1972	247	106	44	66	27	4	2703
1973	289	119	35	94	25	16	2372
1974	288	104	20	99	35	30	3973
1975	521	148	83	201	64	25	4433
1976	222	97	43	66	13	3	2876
1977	257	102	63	56	26	10	3334
1978	274	129	57	65	14	9	3393
1979	127	54	19	33	12	5	2234
1980	209	79	81	40	9	-	2133
1981	219	93	64	47	15	-	2176
1982	236	91	95	44	6	-	1968
1983	170	63	45	38	24	-	1804
1984	303	99	90	97	17	-	1950
1985	263	80	96	68	19	-	1880

[1] Hunting districts: 280, 281, 282 (Hunter questionnaire data).

Appendix 7. Elk harvest and composition, and numbers of hunters in Region 4 of the BMWC elk ecosystem.

Region 4 of the BMWC (Two Medicine, Birch, Teton, Sun, Dearborn)[1]

YEAR	TOTAL	BAB	SPIKE	COW	CALF	UNK	HUNTERS
1964	272	90	44	103	30	4	2716
1965	524	258	96	127	35	9	2763
1966	612	205	132	242	33	0	3254
1967	901	317	119	335	130	0	5404
1968	676	238	82	187	155	14	4475
1969	810	174	64	270	151	0	3974
1970	1033	287	178	411	157	0	4870
1971	671	199	98	264	96	14	5623
1972	890	204	128	397	132	29	8377
1973	974	234	127	369	167	73	8135
1974	393	104	42	102	53	92	6302
1975	491	150	92	170	58	21	5859
1976	176	48	23	69	15	21	5193
1977	402	96	87	136	45	38	4957
1978	361	116	87	104	47	8	4992
1979	224	85	25	92	16	6	4336
1980	509	159	145	151	44	10	4645
1981	423	90	81	217	30	5	4184
1982	464	164	107	162	24	7	2962
1983	310	112	86	100	11	1	3337
1984	955	240	197	418	96	4	4992
1985	852	197	169	382	103	1	4866

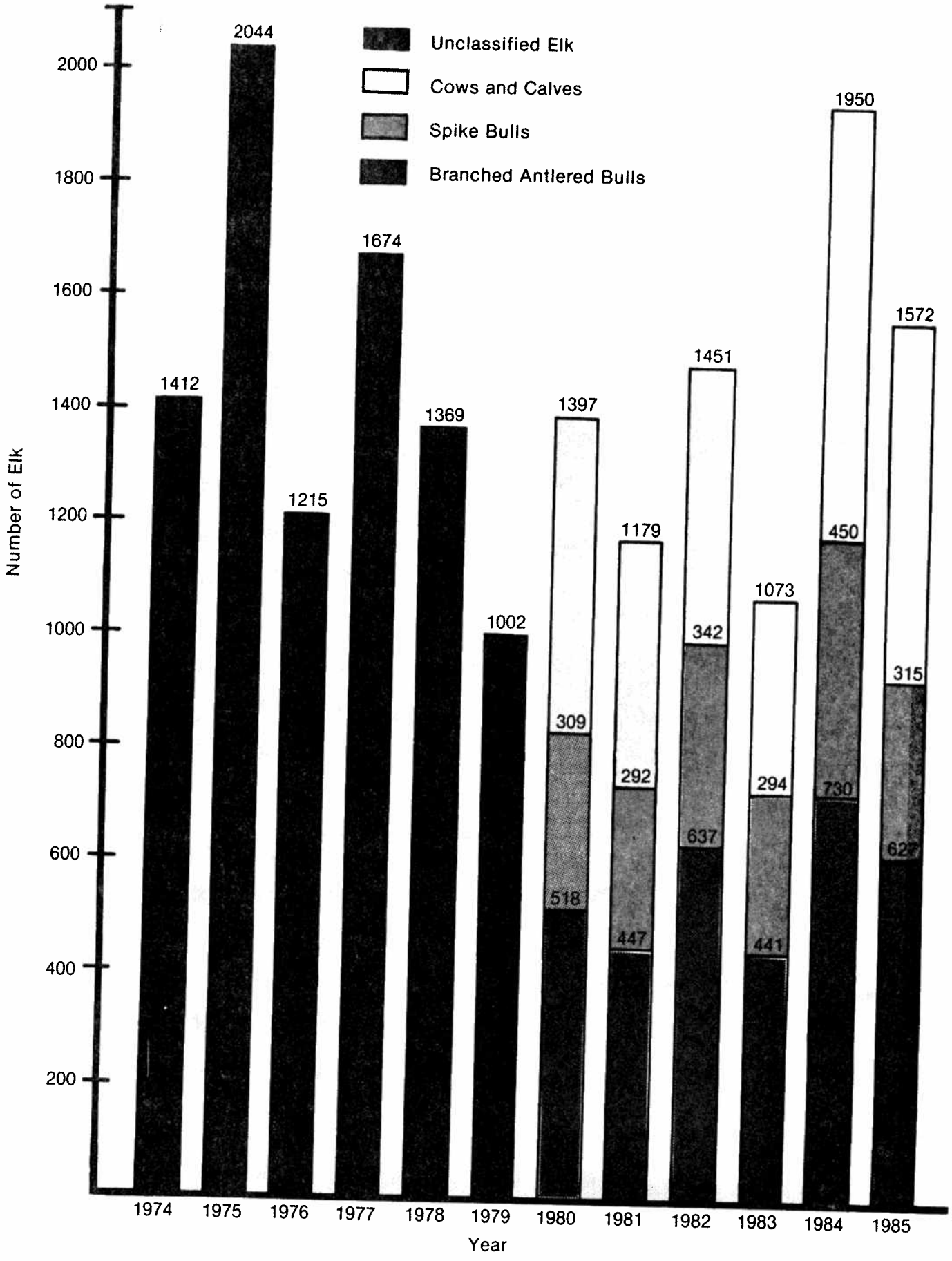
[1] Hunting districts: 415, 422, 424, 425, 427, 428, 441, 442 (Hunter questionnaire data).

Appendix 8. Elk harvest and composition, and numbers of hunters in Hunting District 28 (became 283 in 1973) involving the Clearwater, lower Blackfoot and portions of the Clark Fork river drainages.

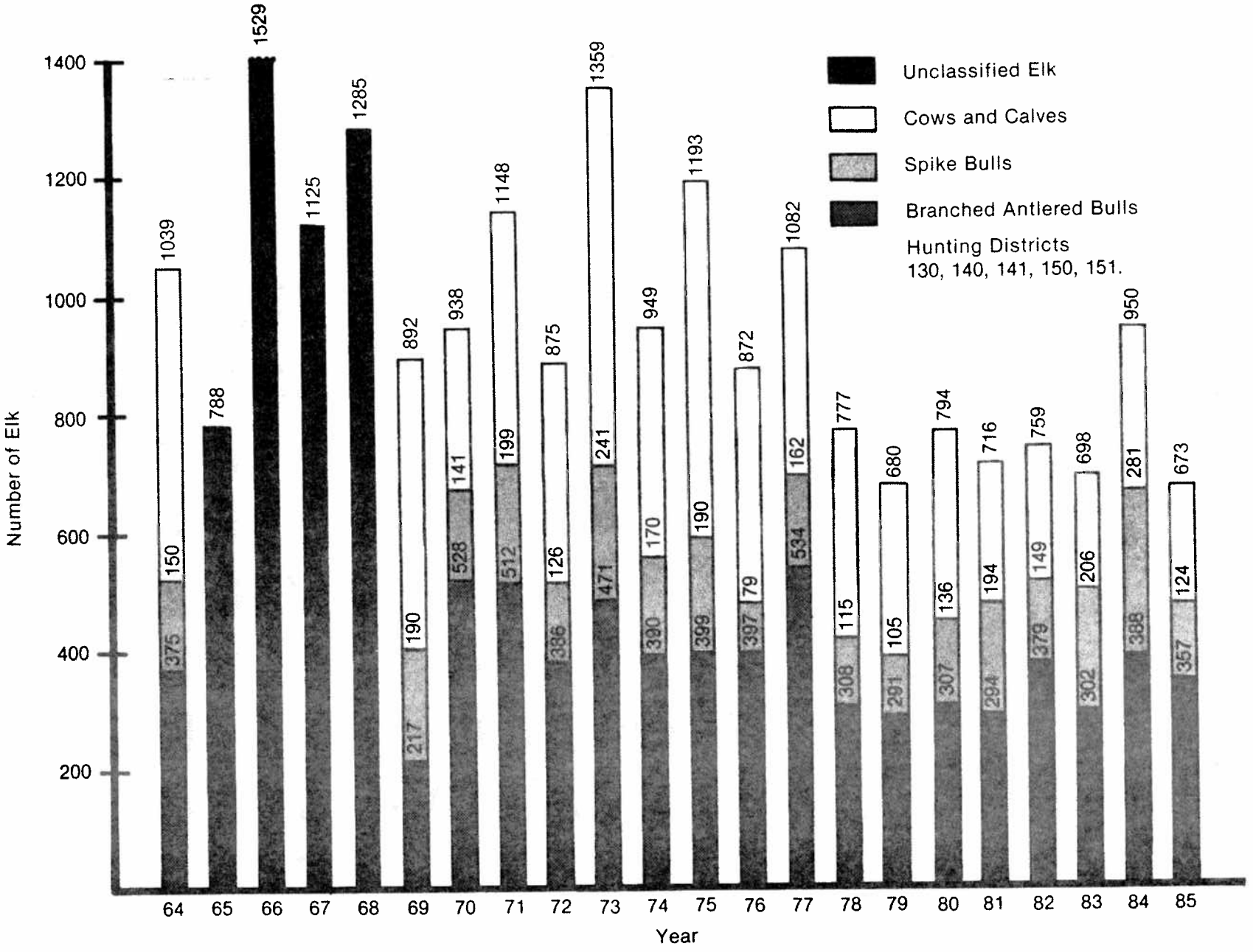
YEAR	TOTAL	BULL	SPIKE	COW	CALF	UNC	HUNTERS	HD #
1964	441	113	67	172	83	6	220	28[1](282, 283, 285)[2]
1965	360	100	50	156	53	0	1669	28 (282, 283, 285)
1966	363	152	34	113	65	0	1858	28 (283, 285)
1967	388	165	20	94	94	14	1686	28 (283, 285)
1968	514	183	59	206	66	0	2095	28 (283, 285)
1969	159	32	15	88	16	8	1551	28 (283, 285)
1970	307	93	74	111	28	0	2015	28 (283, 285)
1971	172	65	46	38	20	3	2323	28 (283, 285)
1972	210	99	22	70	21	0	2286	28 (283, 285)
1973	381	133	63	108	70	7	2917	283 (283, 285)
1974	240	78	38	80	7	37	3286	283 (283, 285)
1975	382	72	48	187	66	9	2647	283 (283, 285)
1976	151	47	38	48	13	5	2074	283 (283, 285)
1977	235	71	49	94	13	8	2563	283 (283, 285)
1978	187	37	52	82	18	0	2647	283 (283, 285)
1979	260	85	60	68	42	5	3057	283 (283, 285)
1980	275	86	132	43	11	3	2950	283 (283, 285)
1981	243	50	132	50	6	5	3043	283 (283, 285)
1982	237	70	100	53	13	1	3630	283 (283, 285)
1983	349	114	158	62	15	0	3485	283 (283, 285)
1984	182	54	95	30	3	0	2409	283
1985	156	45	71	37	2	1	2112	283

[1] About 1/3 of HD 28 occurs in the BMWC elk ecosystem.

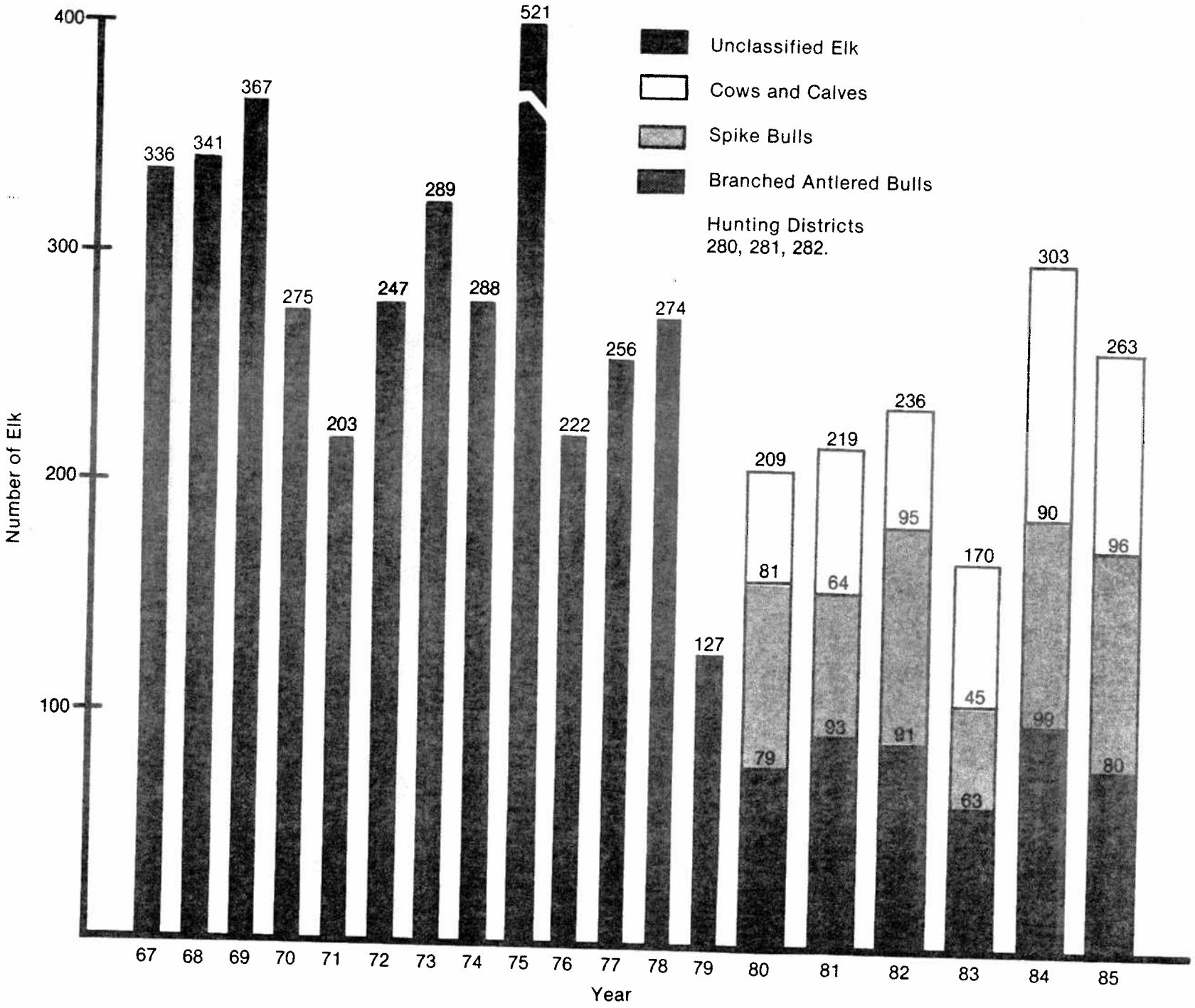
[2] In 1964 and 1965 HD 28 included the Blackfoot-Clearwater Wildlife Management Area (now HD 282), as well as HD's 283, which extends down the Blackfoot and Clark Fork Rivers to Missoula, and 285, west of the Clearwater River to the North Fork Blackfoot, until 1973 when the district number was changed to HD 283. From 1973 to 1983 it included what is now HD 285.



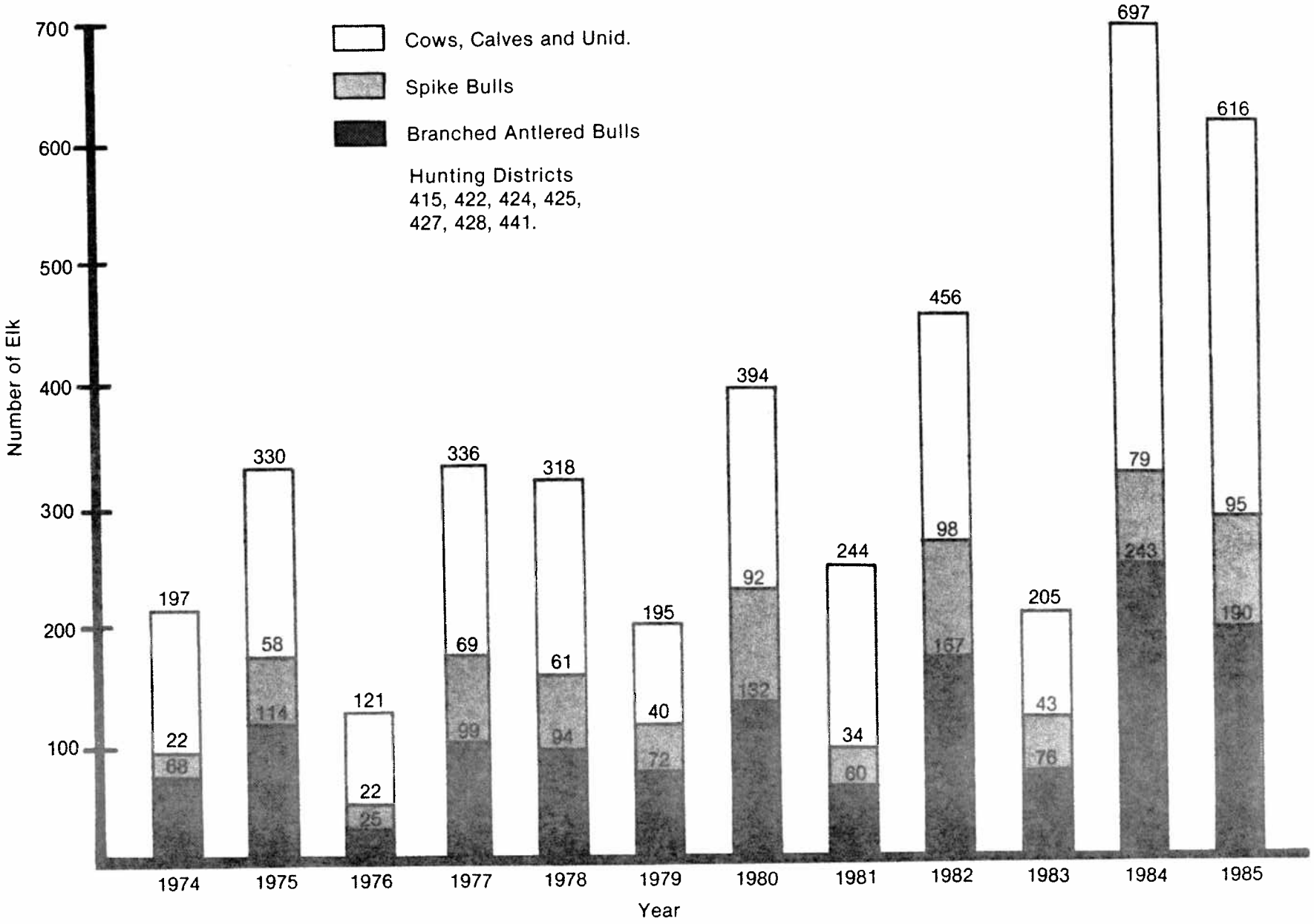
Appendix 9. Elk Harvest in the BMWC Elk Ecosystem (combined check station and questionnaire data.)



Appx. 10. Elk Harvest in Region 1 of the BMWC Elk Ecosystem



Appx. 11. Elk Harvest in Region 2 of the BMWC Elk Ecosystem



Appx. 12. Elk Harvest in Region 4 of the BMWC Elk Ecosystem (Sun River check station data)

Appendix 13. Percent composition of bull elk harvest in Regions 1, 2, 4, and the BMWC elk ecosystem.

	TOTAL BWMC			REGION 1 BMWC			REGION 4 BMWC			REGION 4 BMWC		
	NO. BULLS		%	NO. BULLS		%	NO. BULLS		%	NO. BULLS		%
YEAR	HARV.	BAB	SPIKE	HARV.	BAB	SPIKE	HARV.	BAB	SPIKE	HARV.	BAB	SPIKE
1964			525	71	29			134	67	33		
1965			312	77	23			354	73	27		
1966	1240	66	34	789	65	35	114	90	10	337	61	39
1967	1181	67	33	594	65	35	151	59	41	436	73	27
1968	1011	73	27	520	72	28	171	74	26	320	74	26
1969	835	70	30	407	53	47	190	100	0	238	73	27
1970	1344	72	28	669	79	21	210	75	25	456	61	39
1971	1158	70	30	711	72	28	150	66	34	297	67	33
1972	994	70	30	512	75	25	150	71	29	332	61	39
1973	1227	67	33	712	66	34	154	77	23	361	65	35
1974	830	72	28	560	70	30	124	84	16	146	71	29
1975	1062	66	34	589	68	32	231	64	36	242	62	38
1976	687	79	21	476	83	17	140	69	31	71	68	32
1977	1044	70	30	696	77	23	165	62	38	183	52	48
1978	812	68	32	423	73	27	186	69	31	203	57	43
1979	579	74	26	396	73	27	73	74	26	110	77	23
1980	907	60	40	443	69	31	160	49	51	304	52	48
1981	816	58	42	488	60	40	157	59	49	171	53	47
1982	985	64	36	528	72	28	186	49	51	271	61	39
1983	814	59	41	508	59	41	108	58	42	198	57	43
1984	1295	56	44	669	58	42	189	52	48	437	55	45
1985	1023	62	38	481	74	26	176	45	55	366	54	46

Table 23. Alkalinity, conductivity, and flows measured at points on the Middle Fork of the Flathead River, October, 1980.

Site	Date	Alkalinity mg/l $CaCo_3$)	Conductivity (pmhos/cm)	Flow (cfs)
Middle Fork at Gooseberry Park	10/7	150	220	44.1
Middle Fork at Schafer Meadows	10/10	152	220	56.0
Middle Fork at Granite Creek	10/16	117	185	--
Middle Fork[a/] at Bear Creek	9/18	114	210	198

a/ Alkalinity and conductivity are from measurements made by the Montana Bureau of Mines and Geology, September 13, 1980 (U.S. Forest Service, unpublished data).

Water chemistry and flow data concerning tributaries of the Middle Fork Flathead River are limited. MDFWP measured various parameters for tributaries within the BMWC in 1980 and 1981 (see Appendix).

Maximum water temperatures in the Middle Fork drainage are reached in August and generally do not exceed 20°C (see Appendix report). Mean daily maximum temperatures in August ranged from 14.9°C in Ole Creek to 17.8°C in the Middle Fork Flathead River near Schafer Meadows.

Stream habitat was evaluated using a modification of the system developed by the Resource Analysis Branch of the British Columbia Ministry of the Environment (MDFWP 1983). Each tributary was surveyed by helicopter and divided into one or more reaches. Reaches were identified as portions of the stream having distinct associations of physical habitat characteristics.

Surveys were completed on 51 reaches of 21 major tributaries within the BMWC (Table 24). The Appendix Report includes a complete set of tributary maps delineating important habitat characteristics and barriers.

Table 24. Reach information for Middle Fork tributaries surveyed in 1980.

Drainage	Reach Number	Drainage Area (km^2)	Length (km)	Gradient (%)	Late Summer flow (cfs)
Long Creek		19.37	8.61	2.5	
	1		2.72	1.8	
	2		1.32	1.8	
	3		4.57	3.2	
Granite Creek		74.6	13.42	1.4	13.7
	1		7.89	1.7	
	2[a/]		5.53	1.0	
Lake Creek		19.37	7.43	1.6	21.4
	1		2.54	2.5	
	2		4.89	0.7	
Miner Creek		19.53	4.36	2.8	
	1		2.50	1.7	
	2		1.86	3.7	
Morrison Creek		133.10	22.39	2.0	28.5
	1		7.48	1.1	
	2		3.78	2.3	
	3		8.80	1.7	
	4[a/]		2.23	5.2	
Lodgepole Creek		49.2	10.66	1.1	
	1		6.53	1.1	
	2		4.13	1.0	
Whistler					
	1		3.12	1.6	
Schafer Creek		126.4	14.17	2.1	15.3
	1	4.60	0.4		
	2		1.13	2.1	
	3		4.78	1.0	
	4		3.66	6.0	
W. Fork Schafer					
	1		3.25	3.0	
Dolly Varden Creek		68.4	14.79	1.1	14.7
	1		13.05	1.00	
	2		1.74		
Argosy		15.4	5.19	3.5	
	1		1.46	5.8	
	2		3.73	2.7	

Table 24. (cont'd.)

Drainage	Reach number	Drainage area (km^2)	Length (km)	Gradient (%)	Late Summer flow (cfs)
Calbick Creek		21.70	4.3	2.3	2.5
	1		4.3	2.3	
Cox Creek		51.57	11.56	1.5	1.4
	1		3.27	0.4	
	2		6.15	1.6	
	3		2.14		
Clack Creek		36.57	10.56	3.8	9.9
	1		2.82	1.0	
	2		2.67	1.0	
	3		4.07	7.0	
Bowl Creek		46.80	17.19	2.5	18.3
	1		2.59	2.1	
	2		4.20	2.5	
	3		1.6	0.5	
	4		6.4	3.3	
	5		2.4	3.6	
Basin		25.25	10.5	1.3	4.1
	1		2.1	1.3	
	2		6.6	1.1	
	3		1.8	3.1	
Strawberry Creek		71.04	19.75	1.2	15.2
	1	4.88	0.5		
	2		7.53	1.1	
	3		5.07	1.9	
	4		2.27	1.0	
E. Fork Strawberry				5.00	3.6
	1		3.04	5.2	
	2		1.96		
Trail		49.91	11.74	2.0	9.6
	1		7.74	1.6	
	2		4.0	2.7	
Gateway		19.63	7.47	3.4	4.0
	1		2.49	2.9	
	2		2.16	4.0	
	3		1.77	4.8	
	4		1.05	1.2	
S. Fork					
	1	4.79	2.5		

Fish Populations

It is important to describe the methods used to census fish populations, and determine fish age and growth so that valid comparisons between studies can be made. Refer to the Appendix Report for a detailed description of methods used to obtain the data in this section.

Based on information collected during the Flathead River basin studies, it appears that adfluvial cutthroat are most common in the Middle Fork drainage below Bear Creek (just outside the BMWC). The majority of cutthroat in the river upstream of Bear Creek are thought to be fluvial fish. In 1989, MDFWP tested 26 fish from Cox Creek and 17 fish from the Middle Fork Flathead River near Schafer Meadows. All of these fish were found to be pure westslope cutthroat.

Bull trout in the Middle Fork Flathead system are adfluvial, growing to maturity in Flathead Lake and migrating into the river and tributary systems to spawn. Most juveniles rear in tributary streams from one to three years before returning to the lake. The bull trout has been designated a species of special concern in Montana because of the restricted distribution of the large adfluvial form and because of threats to spawning and rearing habitat.

Underwater fish counts were made in 120 pool, 41 run, 22 riffle, and 10 pocket water habitat units in the Middle Fork above Bear Creek within the BMWC during the summer of 1980. A total of 993 westslope cutthroat, 18 juvenile bull trout, 132 mature bull trout, and 5,762 mountain whitefish were counted by observers during fish density estimates.

Density estimates were made in mid summer for pool and run habitat units in a 23 km section of the Middle Fork above Schafer Meadows and a 48 km section below Schafer Meadows (Table 25).

Table 25. Fish densities (No./100 m^2) by age class in pool and run habitat units of the Middle Fork of the Flathead River during mid summer, 1980. Numbers of each feature snorkeled and numbers of fish observed are in parentheses.

Feature	Cutthroat trout Age I	Cutthroat trout Age II	Cutthroat trout Age III+	Bull trout Age I	Bull trout Age II	Bull trout Age III+	Mountain whitefish Mature	Mountain whitefish <152 mm	Mountain whitefish >152 mm
Middle Fork above Schafer Meadows (7/24 - 7/29)									
Pool (42)	.04 (13)	1.19 (342)	.41 (119)	---	---	.007 (2)	.06 (18)	.33 (96)	2.53 (727)
Run (7)	.09 (4)	0.51 (22)	.33 (14)	---	---	---	.02 (1)	.49 (21)	2.21 (95)
Combined (49)	.05 (17)	1.10 (365)	.40 (133)	---	---	.006 (2)	.06 (19)	.35 (117)	2.49 (822)
Middle Fork below Schafer Meadows (8/5 - 8/12)									
Pool (56)	---	0.01 (3)	.98 (330)	---	---	---	.11 (37)	.26 (86)	7.32 (2475)
Run (3)	---	---	.59 (10)	---	---	---	.29 (5)	--- (195)	11.46
Combined (59)	---	0.01 (3)	.96 (340)	---	---	---	.12 (42)	.24 (86)	7.52 (2670)

Total densities of cutthroat were 1.55 fish per 100 m^2 (about 92 sq yd) surface area in pools and runs in the river upstream from Schafer Meadows and 0.97 fish per 100 m^2 downstream. Only two juvenile bull trout were seen during these mid-summer estimates. River densities of mature bull trout on their spawning migration from Flathead Lake were 0.06 fish per 100 m^2 in the upper section and 0.12 fish per 100 m^2 in the lower section. Mountain whitefish densities were relatively high, averaging 2.84 fish per 100 m^2 in the upper section and 7.76 fish per 100 m^2 in the lower section.

Density estimates by species (Table 26) were made in late summer in the same two areas of the Middle Fork. These estimates were concentrated on 16 km (10 mi) of the river above Schafer Meadows (Gooseberry Park downstream to Cox Creek) and a 16 km section downstream from Schafer Meadows (from 3 m below Schafer Meadows downstream to Granite Creek). Fish densities were estimated in every third pool, run, and pocket water habitat unit, and every fourth riffle habitat unit. Pools were stream features with a definite shallowing at the head and tail of the feature. Runs were deeper than riffles but did not fit the category of pools or pocket water. Pocket water was an area of the stream where the flow is broken by boulders. Riffles were shallow areas of flowing, broken water.

Late summer density of cutthroat in pool and run habitats was less than half of that found in mid-summer estimates. Smaller densities in late summer may be due to oversummer mortality, movement of trout into tributary streams or out-migration to the lower Flathead River or Flathead Lake. More juvenile bull trout were observed in late summer than in early summer. Densities of mature bull trout spawners was twice as high in the upper section and similar in the lower section in the mid-summer and late summer estimates.

Densities of cutthroat and juvenile bull trout in pocket water habitat units in both sections was similar to that found in run habitats and slightly lower than pool densities. No cutthroat trout and very few juvenile bull trout were seen in riffle habitats. Riffles were dominated by mountain whitefish in both river sections averaging just over one fish per 100 m^2 surface area. The average density of mountain whitefish in all features combined was more than ten times greater than the average total trout density.

Table 26. Fish densities by age class for pool, riffle, run, and pocket water habitats in 16-km sections of the Middle Fork of the Flathead River above and below Schafer Meadows during late summer, 1980. Number of features snorkeled and numbers of fish observed in each age class are in parentheses.

Fish per 100 m^2 Surface Area

Feature	Cutthroat Trout			Bull Trout			Mountain Whitefish		
	Age I	Age II	Age III+	Age I	Age II	Age III+	Mature	<152 mm	>152 mm
Middle Fork above Schafer Meadows (8/23 - 8/27)									
Pool (12)	.01 (1)	---	.38 (44)	---	---	.02 (2)	.19 (22)	.43 (50)	2.30 (269)
Run (15)	---	.03 (2)	.26 (19)	.01 (1)	.04 (3)	.03 (2)	.15 (11)	.15 (11)	2.50 (185)
Riffle (11)	---	---	---	.03 (1)	---	.06 (2)	000	.15 (5)	.98 (33)
Pocket water (6)	---	.07 (2)	.22 (6)	.13 (3)	---	.04 (1)	---	.13 (3)	2.43 (66)
Combined (44)	.004 (1)	.016 (4)	.27 (69)	.02 (5)	.012 (3)	.027 (7)	.12 (33)	.27 (69)	2.17 (553)
Middle Fork below Schafer Meadows (9/5 - 9/8)									
Pool (10)	.01 (1)	---	.40 (30)	---	---	---	.24 (18)	.01 (1)	10.91 (820)
Run (16)	.01 (2)	---	.09 (24)	---	---	.004 (1)	.07 (20)	.04 (11)	2.1 (583)
Riffle (11)	---	---	---	---	---	---	---	.20 (14)	.86 (59)
Pocket water (4)	.07 (1)	---	.34 (5)	---	---	---	---	.27 (4)	3.78 (56)
Combined (41)	.01 (4)	---	.13 (59)	---	---	.002 (1)	.10 (38)	.07 (30)	3.48 (1518)

An estimate of total surface area of each feature was calculated. The estimate was based on the total number of each habitat unit in two 16-km (10 mi) sections and average feature size measured on randomly selected features in each reach. A population estimate for each species in the 16 km sections was based on the average density of species in a randomly selected sample of each feature or habitat unit (Table 27). The number of mature adfluvial bull trout was estimated by actual counts of all likely looking habitat in each 10 mile section.

Mountain whitefish dominated the river fish population estimate calculated in this manner, outnumbering trout by more than ten to one. Cutthroat trout in the two sections averaged 575 fish per 16 km (10 mi). This estimate represents late summer numbers of the resident fluvial (river-dwelling) population of cutthroat after summer mortality or migration had occurred. Early summer population numbers of cutthroat were probably much higher. Accurate estimates of juvenile bull trout numbers, especially age I, were difficult to make in the river due to their secretiveness and association with the rocky substrate. They were common under rocks along the river margin, but very few were seen in snorkeling estimates. Mature bull trout were generally easy to observe because of low flows and good water clarity. They were observed mainly in pools and runs. Numbers were generally largest in areas just below the mouths of major bull trout spawning tributaries.

In 1988, MDFWP conducted snorkel-Peterson estimates of westslope cutthroat in the Schafer and Gooseberry section of the river. Workers estimated 216 (±62) cutthroat in the 1.6-mile Gooseberry section and 110 (±41) cutthroat in the 2.5-mile Schafer section. Only 6.5% of the cutthroat in the Gooseberry section were greater than 10 inches. All trout in the Schafer section were less than 10 inches. Drought conditions in the summer of 1988 may have contributed to these low estimates.

MDFWP caught cutthroat in the Gooseberry section at a rate of 3.7 fish per hour. The mean length (n=78) was 191 mm, or 7.5 inches.

Tributaries

Westslope cutthroat trout were found in all Middle Fork tributaries surveyed in 1979 and 1980 (Table 28). Residence of adfluvial cutthroat in most tributaries of the Middle Fork within the BMWC remains uncertain because of the relatively small amount of stream trapping and tag return information available. Juvenile bull trout were observed in all but five of the tributaries surveyed.

Table 27. Estimates of number of cutthroat trout, bull trout, and mountain whitefish in 16-km (10 mi) sections of the Middle Fork of the Flathead River above and below Schafer Meadows. Estimates are based on snorkeling in late summer. These numbers are useful for relative comparison and are not considered total estimates of the population.

Number of Fish per 16-km

Area	Cutthroat trout			Bull trout			Mountain whitefish		
	Age I	Age II	Age III+	Age I	Age II	Age III+	Mature[a/]	<150 mm	>150 mm
Above Schafer Meadows	10	41	670	61	29	6	42	720	5,850
Below Schafer Meadows	28	1	401	<1	55	<1	58	220	10,620

a/ Estimated numbers per km is based on actual counts.

Densities of westslope cutthroat trout in the reaches surveyed (Table 29) averaged 4.2 fish per 100 m^2 of surface area (about 25 fish per 100 linear yards of stream). Stream reaches supporting greater than 10 cutthroat/100 m^2 were identified as critical rearing areas. These included nine reaches of Gateway, East Fork Strawberry, Basin, Cox, Argosy, Challenge, and Twenty-five Mile creeks. Investigations showed that the number of cutthroat in a reach of tributary was related to the amount of fish cover in the form of logs, debris, etc. present in that reach (Fraley and Graham 1982).

Densities of juvenile bull trout were lower than those of cutthroat, partly because of the difficulty in observing the bottom-oriented bull trout (Table 27). Densities of juvenile bull trout in reaches where they were present averaged 1.7 fish/100 m^2 (about ten fish per 100 linear yards of stream). Critical areas for bull trout rearing (as identified by supporting densities of at least 1.5 bull trout/100 m^2) included nine reaches of Whistler, Morrison, Charlie, Strawberry, Granite, Long and Tail creeks.

A total of 333 pools, 425 runs, 441 riffles, and 108 pocket water areas were snorkeled in 1979 and 1980 (including North Fork tributaries). Densities of age II and III+ cutthroat were largest in pools, followed by runs, pocket water areas, and riffles in order of decreasing abundance (see Appendix Report). Bull trout densities varied little between features, except for age II fish which had substantially larger densities in pools than in other features.

Refer to the Appendix Report for maps showing all the fisheries characteristics of each Middle Fork tributary.

Table 28. Fish distribution in upper (above Bear Creek) Middle Fork tributaries, + = species present, - = species absent, * = migratory cutthroat (confirmed by trapping and tagging), ? = unknown, needs further study.

	Cutthroat Trout		
	Migratory	Resident	Bull trout
Charlie	?	+	+
Long	?	+	+
Bergsicker	?	+	+
Twenty-five Mile	?	+	+
Granite	*	+	+
Challenge	*	+	+
Dodge[a/]	*	+	+
Lake	?	+	+[b/]
Miner	?	+	-
Morrison	*	+	+
Lodgepole	?	+	+
Whistler	?	+	+
Schafer	?	+	+
W. Fork schafer	?	+	-
Dolly Varden	?	+	+
Argosy	?	+	+
Calbic	?	+	=
Cox	?	+	-
Clack	?	+	+
Bowl	?	+	+
Basin	?	+	+
Strawberry	?	+	+
E. Fork Strawberry	?	+	+
Trail	?	+	+
S. Fork Trail	?	+	-
Gateway	?	+	+

a/ Outside the BMWC boundary
b/ Bull trout were present below the falls.

Table 29. Mean densities (No./100 m^2) of cutthroat and juvenile bull trout in Middle fork tributaries surveyed during the summer of 1979 and 1980. Total for each species refers to age classes I, II, and III+ combined.

Fish per 100 m^2 Surface Area

Stream	Reach No.	Cutthroat Trout Age 0	Age I	Age II	Age III+	Total	Bull Trout Age 0	Age I	Age II	Age III+	Total
Charlie Cr.	001	0.5	1.0	2.0	1.0	4.0	1.5	5.6	0.7	---	6.3
	002	---	---	---	0.3	0.3	---	4.5	4.2	---	8.7
Long Cr.	001	---	---	---	---	---	---	---	0.2	---	0.2
	002	0.2	---	0.2	0.5	0.7	---	0.2	0.7	0.3	1.2
	003	---	0.2	0.5	0.1	0.8	---	0.6	0.4	0.9	1.9
Bergsicker	001	---	---	---	0.6	0.6	---	---	0.4	---	0.4
Twenty-five Mile Cr.	003	---	5.7	5.0	3.0	13.7	---	---	---	---	---
Granite Cr.	001	---	---	---	0.5	0.5	---	---	0.7	1.4	2.1
	002	---	0.2	---	1.3	1.5	0.1	---	0.2	---	0.2
Challenge	001	1.3	3.8	6.6	3.5	13.9	---	---	---	0.25	0.25
Lake Cr.	001	---	---	0.3	2.1	2.4	---	---	---	---	---
	002	---	---	---	0.5	0.5	---	---	---	---	---
Miner Cr.	001	---	---	---	1.3	1.3	---	---	---	---	---
	002	---	---	---	2.8	2.8	---	---	---	---	---
Morrison Cr.	001	---	---	---	0.2	0.2	---	0.2	0.3	0.3	0.8
	002	---	---	---	0.7	0.7	---	0.5	1.1	2.4	4.0
	003	---	---	0.6	3.0	3.6	---	---	2.7	5.1	7.8
	004	---	---	---	---	---	0.4	0.5	0.5	0.3	1.3

Table 29 (cont'd.)

Fish per 100 m^2 Surface Area

Stream	Reach No.	Cutthroat Trout Age 0	Age I	Age II	Age III+	Total	Bull Trout Age 0	Age I	Age II	Age III+	Total
Lodgepole Cr.	001	---	---	0.1	0.4	0.5	---	0.3	---	---	0.4
	002	0.2	0.8	2.3	1.2	4.3	---	0.2	---	0.2	0.4
Whistler Cr.	001	---	---	0.2	1.2	1.4	---	0.5	5.5	1.2	7.2
Schafer Cr.	001	---	0.1	---	---	0.1	0.1	---	---	---	0.1
	002	---	0.1	0.5	1.1	1.7	---	---	---	---	---
	003	---	---	0.8	3.1	3.9	---	---	---	---	---
	004	---	1.3	1.7	0.9	3.9	---	---	---	---	---
W.F. Schafer	001	---	0.7	2.2	2.6	5.5	---	---	---	---	---
Dolly Varden	001	---	---	0.1	0.1	0.2	0.1	---	---	---	0.1
Argosy Cr.	001	---	---	0.2	1.0	1.2	---	---	---	0.4	0.4
	002	---	2.2	7.9	1.3	11.4	---	0.9	0.2	---	1.1
Calbic Cr.	001	---	2.4	4.1	0.6	7.1	---	0.6	---	---	0.6
Cox Cr.	001	---	---	0.1	0.3	0.4	---	---	---	---	---
	002	1.1	1.1	2.7	6.5	10.3	---	---	---	---	---
Clack Cr.	003	---	---	---	0.6	0.6	---	---	---	---	---
Bowl Cr.	001	---	---	0.2	---	0.2	---	---	---	---	---
	002	---	---	---	0.3	0.3	---	---	---	---	---
	003	0.1	1.0	1.2	2.4	4.6	---	0.2	0.4	0.2	0.8
	004	---	0.3	---	0.6		0.9	---	---	0.1	0.3 0.4
	005	---	---	0.2	---	0.2	---	---	---	0.2	0.2
Basin Cr.	001	0.4	3.0	4.2	4.5	11.7	---	0.1	---	---	0.1
	002	1.2	1.3	3.4	2.0	6.7	---	---	0.5	0.1	0.6
	003	---	0.2	1.4	11.9	13.5	---	---	---	0.7	0.7

Table 29 (cont'd.)

Fish per 100 m^2 Surface Area

Stream	Reach No.	Cutthroat Trout Age 0	Age I	Age II	Age III+	Total	Bull Trout Age 0	Age I	Age II	Age III+	Total
Strawberry	001	---	---	---	0.1	0.1	---	---	---	0.1	0.1
	002	---	0.7	2.6	2.0	5.3	---	0.2	0.2	0.3	0.7
	003	---	---	---	0.1	0.1	---	---	0.2	---	0.2
	004	---	0.2	0.4	---	0.6	---	0.2	3.1	---	3.3
E.F. Strbry	001	---	---	2.1	9.6	11.7	---	---	0.6	0.8	1.4
	002	---	0.3	---	0.8	1.1	---	---	---	0.3	0.3
Gateway Cr.	001	---	---	0.5	0.3	0.8	---	0.4	0.5	0.2	1.1
	002	---	---	0.4	1.3	1.7	---	---	---	---	---
	003	0.6	3.3	4.0	3.2	10.5	---	---	---	---	---
	004	2.0	1.8	18.7	6.7	27.2	---	---	---	---	---

CUTTHROAT TROUT

Age and Growth

Eighty-seven percent of the cutthroat trout caught in tributary streams were 0-3 years old at time of aging, while 86 percent of the fish caught in the river were 3-5 years old. We determined that 75 percent of the fish collected in the Middle Fork Flathead River had reared two or three years in the tributaries before entering the river (see Appendix Report). About 22 percent had reared one year in tributaries. Lengths of fish each age class were larger in the river than in the tributaries (Table 30).

Table 30. Calculated lengths and increments of length (from scale samples) for cutthroat trout collected in the Middle Fork of the Flathead River and tributaries in 1980.

Number	Length at Age (annulus)	(mm)	Age of Fish 1	2	3	4	5
		Middle Fork Flathead River					
1	0	--					
2	16	51	95				
3	82	49	99	154			
4	69	50	97	156	217		
5	17	51	107	161	217	269	
Grand Mean Calculated Length			50 (2.0 in)	99 (3.9 in)	156 (6.1 in)	217 (8.5 in)	269 (10.6)
Number of Fish			(184)	(184)	(168)	(86)	(17)
Length Increment (mm)			50	49	57	61	52
		Middle Fork Tributaries					
1	45	49					
2	135	51	95				
3	164	51	95	138			
4	24	48	90	141	191		
5	4	59	101	139	204	251	
Grand Mean Calculated Length			51 (2.0 in)	95 (3.7 in)	139 (5.5 in)	193 (7.6 in)	251 (9.9 in)
Number of Fish			(377)	(327)	(191)	(28)	(4)
Length Increment (mm)			51	44	44	52	47

Cutthroat captured by Department anglers in the Middle Fork Flathead River in 1980 averaged 9.3 inches in length (Table 31). Over one-third of the cutthroat were greater than ten inches. Cutthroat captured by Department anglers in tributaries of the Middle Fork averaged 5.7 inches.

Table 31. Size distribution of westslope cutthroat trout caught by department anglers in the Middle Fork of the Flathead River and in tributaries to the Middle fork Flathead River during summer, 1980.

Number of Fish	x Length	% > 6" (150 mm)	% > 8" (200 mm)	% > 10" (250 mm)	% > 12" (300 mm)
		Middle Fork Flathead River			
184	9.3" (237.4 mm)	95.1	78.8	38.0	12.5
		Middle Fork Tributaries			
381	5.7" (145.5 mm)	47.8	13.6	3.4	1.0

Back-calculated lengths of bull trout based on juveniles and adult spawners collected in the Middle Fork drainage differed substantially from lengths calculated from juveniles only (see Appendix Report). It appears that back-calculations for annuli 1, 2, and 3 (age marks relating to year 1, 2 and 3 in the life of the fish) are not accurate when adult spawners are included in the calculations. A total of 40 otoliths (inner ear bones) from juvenile bull trout were aged. Ages assigned otoliths and scales from the same fish were in nearly 100 percent agreement.

Average length of adult bull trout spawners collected by hook and line in the Middle Fork drainage in 1980 was similar to average lengths recorded for adult bull trout in some previous studies in the Flathead River system (Table 32).

Refer to the Appendix Report for more detailed information on age and growth of fish in the Middle Fork drainage.

Food Habits of Trout

Ephemeroptera (mayflies), Diptera (true flies) and Trichoptera (caddis flies) were the major orders of insects in the diet of cutthroat less than or equal to 110 mm (4.3 in) in length in tributaries of the Middle Fork Flathead River (Appendix B). In the diet of cutthroat greater than 110 mm in length, major orders were Hymenoptera (terrestrial adults), Diptera adults, and Trichoptera.

Diets of cutthroat from the Middle Fork Flathead River included winged adults of the orders Trichoptera, Diptera, and Ephemeroptera (see Appendix Report). Large cutthroat trout in the Middle Fork Flathead River and tributaries feed largely on the water surface for winged insects.

Mayflies were by far the most important insect order in stomachs of both small and large bull trout in tributaries of the Middle Fork Flathead River. Other important orders in bull trout diets were Diptera and Trichoptera.

Baetidae was the major family in bull trout stomachs collected in the Middle Fork drainage, followed by Ephemerellidae and Siphlonuridae (see Appendix Report). Siphlonuridae was not a major mayfly family in Middle Fork benthic insect samples, but its presence in bull trout stomachs indicated selection for this family. The "free swimming" habits of siphlonurids may make them easier prey for the juvenile bull trout. Although Heptageniidae was the major mayfly family in the Middle Fork benthic samples, it was not the predominant family in the stomachs of juvenile bull trout collected from the Middle Fork drainage.

Table 32. Comparison of lengths of adult bull trout collected in the Middle Fork drainage with previous studies in the Flathead River system.

Study	Average Length (mm)	Number of Fish
Middle Fork, BMWC, 1980	618	35
North Fork Creel Census, 1979	638	36
Flathead River, all Forks, Creel Census, 1975	628	46
Middle Fork River Trap at Bear Creek, 1957	622	87

Table 33. Numbers of bull trout redds in tributaries of the Middle Fork Flathead River during years when nearly complete surveys were conducted.

Tributary	1986	1982	1981	1980	Average
Strawberry	41	39	21	17	30
Trail	53	30	26	31	35
Bowl	36	19	10	29	24
Clack	16	7	7	10	10
Schafer	30	17	12	10	17
Dolly Varden	42	36	31	21	33
Morrison[a/]	52	86	32[b/]	75	61
Lodgepole	42	23	18	14	24
Granite[a/]	37	34	14[b/]	34	30
Bear[c/]	21	23	12	9	16
Long*	*	*	8	--	
Charlie	*	*	*	7	--
Ole	36	51	23	19	32
Nyack[c/]	27	23	14	14	20
Lake	*	*	*	1	--
Dirtyface	*	*	*	0	--
Elk	*	*	*	1	--
Coal[c/]	3	*	13	*	25
Park[c/]	87	*	13	*	25
Total Middle Fork		523	388	237	300

a/ Portions of the stream are outside the BMWC.
b/ Counts low due to ice cover.
c/ Entire stream is outside BMWC.

Table 34. Catch information from voluntary creel cards returned in 1979, 1980 and 1981. Number of fish caught is in parentheses.

Year	Number of Anglers	Total Angler Hours	Catch per Hour		
			Cutthroat Trout	Bull Trout	Mountain whitefish
1979	44	228	1.61 (367)	.08 (19)	.91 (197)
1980	38	243	1.68 (408)	.05 (11)	.97 (236)
1981	26	113	1.21 (137)	.05 (6)	.36 (41)

Survey of Bull Trout Spawning Sites

Numbers of bull trout spawning sites (redds) in tributaries of the Middle Fork Flathead drainage have ranged from 237-523 during years when all streams were surveyed (Table 33). During these years, bull trout spawning sites in the Middle Fork drainage averaged 46 percent of the total basin-wide count (including the North Fork). The majority of bull trout from Flathead Lake which spawn in the Middle Fork drainage enter tributaries within the BMWC.

Bull trout redds have been counted in selected streams within the BMWC annually since 1979. These "monitoring counts" have fluctuated but generally indicate a stable spawning population.

Microhabitat measurements (size, water depth) of bull trout redds varied between tributaries (see Appendix Report). Redds averaged 2.2 m (2 yd) in length and 1.0 m (0.9 yd) in width, and were built in water depths averaging 0.26 m (0.3 yd).

Survey of the Fishery

Westslope cutthroat trout were the most numerous species in the recreational catch on the Middle Fork Flathead River from 1979-1981 based on voluntary creel card returns from anglers (Table 34). Anglers released approximately half of the cutthroat and most of the mountain whitefish caught. The release rate for bull trout was variable between years, ranging from 90 percent in 1979 to 33 percent in 1981.

In 1988 and 1989, MDFWP conducted creel card surveys in the entire BMWC. Returns for the Middle Fork drainage were low (Table 35). Only 11 anglers returned cards in 1988, reporting 20 individual trips to specific waters.

In 1980, Department anglers caught cutthroat in the Middle Fork Flathead River at a rate of 2.15 fish per hour (Table 36). Bull trout catch rates averaged 0.33 fish per hour. These rates (especially for bull trout) were higher than recorded in 1962, but anglers in 1980 had the advantage of fishing areas where snorkel surveys had located mature bull trout.

Catch rates during 1980 in Middle Fork tributaries within the BMWC ranged from 0.5 to 12.5 fish per hour (Table 37). Mean lengths of cutthroat ranged from 134 mm to 293 mm.

Table 35. Results from creel card surveys of anglers in the Middle Fork drainage during 1988 and 1989.

	1988	1989
Number of angler trips surveyed	20	17
Number of angler hours	110	81.25
Percent outfitted	20	0
Percent fished river	75	59
Percent fished creek	25	35
Percent fished lake	0	6
Tackle used		
Flies	40	67
Lures	15	0
Bait	0	0
Combination	40	0
No information	5	33
Westslope cutthroat caught	88	13
number per hour	0.8	.16
percent kept	35.0	15.0
percent > 12"	9.0	18.0
Bull trout	7	0
number per hour	0.07	--
percent kept	14.0	--
Percent > 12"	14.0	--
Mountain whitefish	23	0
number per hour	0.2	--
percent kept	48.0	--
percent > 12"	2.0	--

Mountain Lakes

Information on mountain lakes in the Middle Fork drainage within the BMWC is limited (Table 38). Cutthroat populations (genetically untested) exist in 12 lakes. Populations are maintained by planting in six of the lakes and by natural reproduction in six of the lakes. The level of fishing pressure and harvest in these lakes is not well documented. Fishing use is relatively high on Stanton, Marion, Scott, Flotilla and Castle, and relatively light on Dickey, Tranquil (east and west), Cup and Almeda.

Table 36. Catch rates (number of fish per hour) from hook and line sampling by Fish, Wildlife and Parks personnel on Middle Fork of the Flathead River within the BMWC during the summers of 1962 and 1980. the number of fish caught of each species is in parenthesis.

Year	Total fisherman hours	Number of Fish Caught per Hour		
		Cutthroat trout	Bull trout	Mountain whitefish
1962	164	.71 (117)	.06 (1)	.25 (39)
1980	104	2.15 (224)	.33 (35)	.62 (20)
1988	Gooseberry			
1988	Schafer			

Table 37. Catch information from hook and line sampling during the summer of 1980 by Department personnel on tributaries to the Middle Fork Flathead River within the BMWC.

Stream Name	Number Caught	Angler Hours	Fish/ Hour	Minimum Number Measured	Maximum Length (mm)	Length (mm)	Average Length (mm)	Average Length (inches)
Granite	15	3.5	4.3	15	220	325	265	10.4
Lake	4	--	--	4	230	280	254	10.0
Morrison	6	5.5	1.1	4	255	310	293	11.5
Lodgepole	4	2.0	2.0	3	120	162	143	5.6
Schafer	30	6.0	5.0	30	105	228	153	6.0
Dolly Varden	6	13.0	0.5	3	187	248	217	8.5
Cox	15	6.0	2.5	12	135	216	176	6.9
Bowl	24	4.0	6.0	24	101	250	146	5.7
Basin	75	6.0	12.5	75	75	202	134	5.3
Strawberry	8	4.0	2.0	4	135	310	192	7.6
Trail	10	3.0	3.3	9	120	240	180	7.1
Gateway	1	1.5	0.7	1	252	252	252	9.9

Table 38. Fisheries information for lakes in the Middle Fork drainage within the BMWC (Wct - westslope cutthroat, Rb - rainbow trout, FSu = Finescale sucker, Mwf = Mountain Whitefish, Yct = Yellowstone cutthroat). Year of the most recent plant is in parentheses.

Lake	Species	Planted/Natural	Common Size Range
	Middle Fork Drainage		
Stanton	Wct, Mwf, FSu	Natural	8 - 13"
Marion	Wct, (Rb/Wct)?	Natural	10 - 12"
Almeda	Wct	Planted (1988)	12 - 16"
East Tranquil	Wct	Natural	10 - 18"
West Tranquil	Wct	Natural	13 - 20"
Elk	Wct	Planted (1988)	13 - 17"
Castle	Wct	Planted (1989)	11 - 18"
Scott	Wct	Natural	13 - 15"
Flotilla	Wct (Yct/Wct?)	Natural	9 - 16"
Cup	Wct	Planted (1988)	11 - 16"
Dickey	Wct	Planted (1990)	10 - 13"
Bergsicker	Wct	Planted (1990)	11 - 13"

BLACKFOOT RIVER DRAINAGE

Description of the Drainage

The Blackfoot River flows 122 miles in a westerly direction from its source near the continental divide to its confluence with the Clark Fork River at Bonner, Montana (Figure 8). Principle tributary streams in downstream order are: Alice, Landers Fork, Nevada, North Fork, Chamberlain, Monture, Clearwater, Belmont, Gold, and Union creeks. The Landers Fork, North Fork, Clearwater and Monture creeks are the largest of the Blackfoot's tributaries; three of these originate in the BMWC (Clearwater does not). The Blackfoot River drainage in non-wilderness areas has and continues to be used extensively for timber production, mining, and livestock production. Segments of the Blackfoot River tributaries that occur in the BMWC dissect high elevation mountainous terrain and generally reach the broad Blackfoot River Valley shortly after leaving the wilderness and national forest boundaries. The Blackfoot River is essentially a "free-flowing" stream except for a small diversion near the mouth that serves the wood products mill at Bonner.

Fishing and other forms of water-based outdoor recreation are important in the Blackfoot drainage. The formation of the Blackfoot River Conservation and Recreation Management Plan to assure orderly public access through private lands in 1977 has greatly increased the availability of the Blackfoot River to recreationists. A recreational user survey conducted in 1977 during the first year of the plan found that, below the Clearwater River, anglers comprised 80 percent of the recreational users of the Blackfoot River. Campers and non-fishing floaters accounted for most of the remaining 20 percent of recreational users. The river corridor development resulted in the reclassification of the Blackfoot River to a Class 1 stream in the state of Montana river classification system.

A total fishing pressure estimate based on statewide mail survey in the 1984-85 fishing season was 40,824 angler-days (334 per mile). Most of the fishing pressure occurred below the Clearwater River with a pressure estimate of 832 man-days per mile. The Blackfoot contains wild populations of rainbow, westslope cutthroat, Yellowstone cutthroat, brook, brown, bull trout, and mountain whitefish. Western Montana's best trophy fluvial bull trout population resides in the Blackfoot River.

Densities of the large bull trout were estimated at one to two fish per mile in the lower Blackfoot by the MDFWP. Tributary streams originating in wilderness area are known to be key spawning streams for the fluvial bull trout.

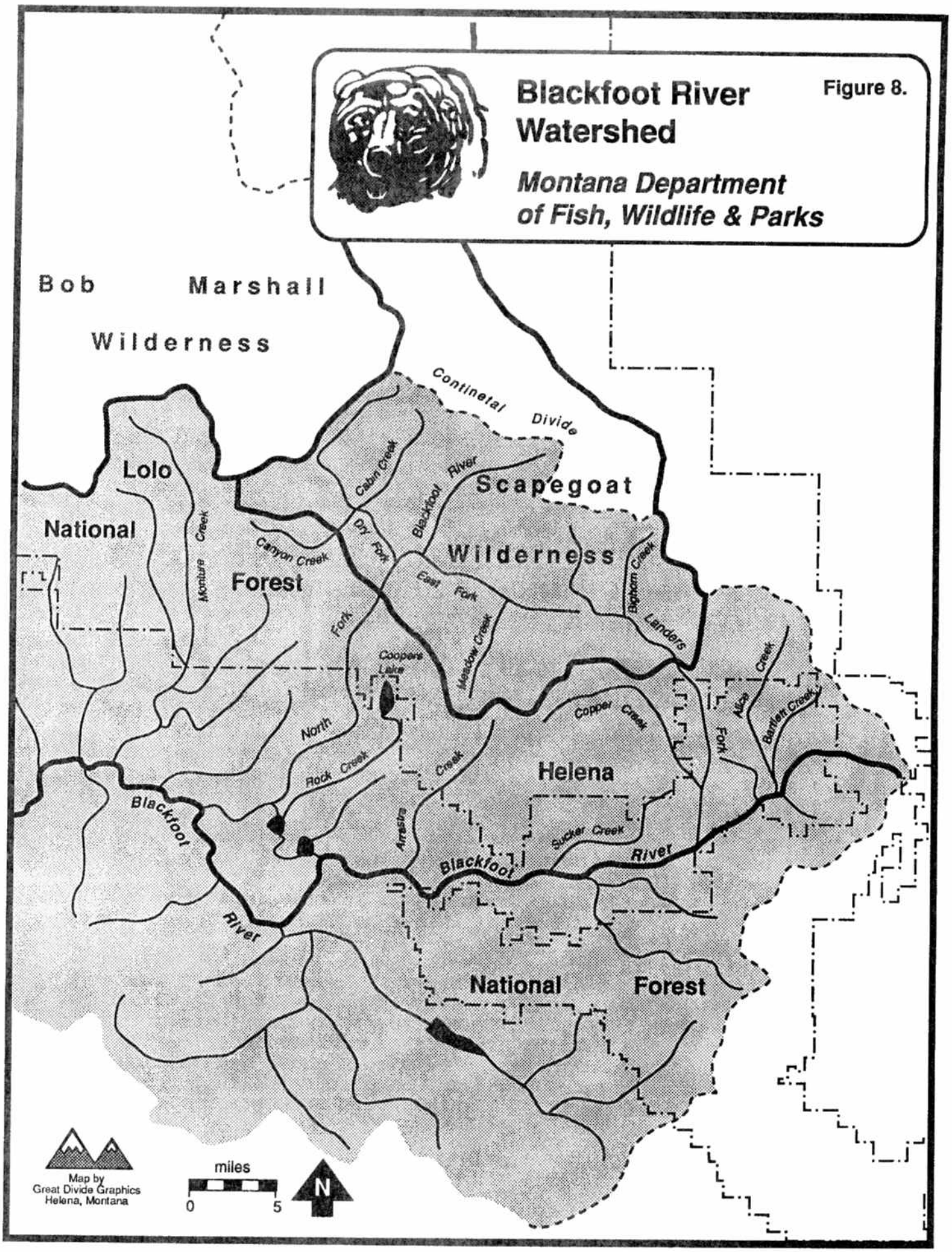
In 1988, MDFWP conducted a creel card angler survey in the Blackfoot drainage within the BMWC. Anglers surveyed fished 73 hours and caught 46 cutthroat (0.6 fish per hour), one bull trout and two mountain whitefish. Most anglers fished lakes.

Stream discharge on the Blackfoot River near the mouth averages 1,633 cubic feet per sec (cfs) and has ranged from 19,200 cfs (June 10, 1964) to 200 cfs (January 4, 1950) USGS (1986). Instream flows for recreational purposes were appropriated for the Blackfoot River in 1970 by the Montana Fish and Game Commission.

The Blackfoot River drainage portion of the Bob Marshall wilderness complex provides some of the best spawning opportunities for the large fluvial bull that inhabit the Blackfoot and North Fork of the Blackfoot River. The landforms that make up these drainages have been notoriously unstable with frequent mass ground movements even in the wilderness area. The hydrology of the drainages appear to be similar for all the major streams. These streams have reaches that go dry in the low flow months because of loss of stream flow to subsurface aquifers. The stream flows generally reappear as separate spring creeks and within the stream channel downstream several kilometers. This hydrologic feature probably contributes to the successful spawning of the bull trout and helps reduce the impacts of the unstable land movements. Studies in the Flathead drainage have identified this hydrologic pattern as being important to successful spawning in the Flathead and Swan drainages.

Fisheries by Drainage

All of the drainages that follow in this section have one characteristic in common: an inadequate habitat and biological database. The lakes in the Blackfoot drainage have received some attention but the streams, including the major drainages, have essentially no significant data collections. The Blackfoot drainage currently holds the best populations of trophy fluvial bull trout in the state. However, these unique fish are found in very low densities and spawning runs in tributaries are extremely small, sometimes numbering a single spawning pair.


Blackfoot River Watershed
Figure 8.
Montana Department of Fish, Wildlife & Parks
Bob Marshall Wilderness
Continental Divide
Lolo National Forest
Scapegoat Wilderness
Helena National Forest
Cabin Creek
Blackfoot River
Dry Fork
Canyon Creek
Monture Creek
East Fork
Meadow Creek
Bigham Creek
Landers Fork
Coopers Lake
North Fork
Rock Creek
Arrastra Creek
Copper Creek
Sucker Creek
Alice Creek
Bartlett Creek
Blackfoot River
Blackfoot River
Map by Great Divide Graphics Helena, Montana
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LANDERS FORK OF THE BLACKFOOT RIVER

The Landers Fork is suspected to contain bull trout, westslope cutthroat, brook trout, sculpin, and mountain whitefish. No data exists for trout populations within the wilderness boundaries. A fall stream flow measured by MDFWP personnel at the highway 200 crossing was 44 cfs. The Landers Fork goes underground in a section below the wilderness boundary like several other streams and sections of streams in the upper Blackfoot River drainage.

Tributaries

Tributary streams of the Landers Fork include Fickler, Baking Powder, Lookout, Lake, Maryann, Middle Fork and Crow creeks. No fisheries information is available for most of these streams. Bighorn Creek was planted with 3,600 undesignated cutthroat 2.5 cm long in 1950. These fish originated from the hatchery in Ovando. Baking Powder Creek was planted with 3,100 rainbow trout 2.5 cm long in 1952. Ringeye Creek was planted with 4,000 undesignated cutthroat 2.5 cm long in 1943 from the hatchery in Ovando.

Lakes

Bighorn Lake. Bighorn Lake, located 24 km by trail up the Landers Fork and Bighorn Creek, has a good wild population of lakeshore-spawning cutthroat trout. The wild population probably originates from the 1952 plant of 6,800 cutthroat trout from the Ovando hatchery. Records in the regional office of the MDFWP based on phenotype only indicate that the fish are Yellowstone cutthroat. However, no records exist to indicate a plant of Yellowstone cutthroat was ever made in the lake. Recent findings concerning the diverse phenotypes in westslope cutthroat certainly preclude a conclusion that the lake is inhabited by Yellowstone cutthroat. The lake is 5.4 hectares in area and has a maximum depth of 16 m.

This lake population of cutthroat is currently in a near natural condition and does not appear to be impacted by fisherman harvest in regards to population age and size distribution. The long distance to the lake coupled with a lack of other significant destinations make the trip to Bighorn Lake a single goal trip and helps reduce pressure. Angler trips into the lake in 1985 indicate that both size and numbers of cutthroat are

being maintained with the current pressure. All efforts to improve access into this area or closely adjoining areas should be avoided because of the highly vulnerable nature of this cutthroat fishery.

The Canyon Creek fire of 1988 burned the timbered perimeter around the lakeshore.

Little Crystal Lakes (unnamed lakes northeast of Heart Lake). Two of the four lakes have the capability to produce a fishery. The middle largest lake (Little Crystal T16N, R8W, S17CB) had a remnant population of rainbow trout through the 1970s which has disappeared in the 1980s according to the local game warden. The other lake (upper Little Crystal T16N, R8W, S17CA) was planted with 200 westslope cutthroat in 1977 (unsuccessful in establishing a fish population). The lakes are both 6 m maximum in depth and less than 1 hectare in area.

The lakes are located next to Heart Lake, which has been heavily used over the past several years, but because of no trail access Little Crystal Lakes have received no noticeable use. No trail should ever be constructed to these lakes. A fisheries could be reestablished in both of these lakes.

Heart Lake. Heart Lake is located 9 km from the trailhead at Indian Meadows which is a major access trail for the Lincoln-Scapegoat Wilderness. The lake has a surface area 13.4 ha and a maximum depth of 15.2 m. A small outlet, with about 0.056 cubic meters per second (CMS) flow in the spring, drains into the Landers Fork via an unnamed tributary. Heart Lake was first planted in the early 1930s with grayling and, again, in the 1960s, a total of 874,000 2.5 cm fish were introduced. Undesignated cutthroat were planted during the period 1942 to 1952 at a rate of 3,000 to 16,000 (fry to 5 cm) for a total of 48,000 introduced. Rainbow were planted once in 1937 (10,000 rainbow fry).

Overnight gillnet sets in 1959 caught cutthroat and grayling at a rate of 1 and 2.5 per set respectively. An overnight gillnet set in 1968 produced 29 grayling and no cutthroat. The grayling averaged 25.4 cm (10 in) TL and ranged between 22.6 and 37.3 cm TL. An overnight gillnet set in 1975 produced 39 grayling with an average length of 37.3 cm TL and a range of 35.0 to 40.6 cm TL. Grayling ages were determined from scales and ranged from five to seven years in the 1975 sample. Angler and warden reports from Heart Lake in 1986 indicate that the grayling population disappeared. In 1974, the lake had an estimated use of 202 angler-days based upon statewide mail survey which may be conservative.

This lake with a 30 percent littoral zone has produced good grayling fishing in the past and could be considered for reintroduction of the grayling and periodic replanting. The plant in 1965 appeared to survive for at least ten years which would probably be a good planting cycle. In 1988, MDFWP planted 5,000 westslope cutthroat trout in the lake, and in 1989, 20,000 grayling were also planted.

Webb Lake. Webb Lake, a moderately productive moraine lake, is located about 11 km from the Indian Meadows trailhead. A USFS guard station cabin is built on one end of the lake and is used by administrative crews while in the area. Webb Lake is 2.7 ha in surface area and has maximum depth of 1.3 m. The outlet drains into an unnamed tributary to Ringeye Creek which flows into the Landers Fork. Webb Lake always has a high amount of turbidity that probably contributes cover for the fish residing there. Cutthroat trout captured in gillnets appear to be Yellowstone cutthroat.

Webb Lake was planted from 1940 to 1952 with an undesignated strain of cutthroat from hatcheries in Anaconda and Ovando. The annual plants of 5 cm fish varied from 1,000 to 15,000 for a total of 50,000 fish through the period. Two overnight gillnet sets in 1959 captured an average of 15 fish per set with an average TL of 29.5 cm and a range of 19.0 to 48.8 cm TL. The length frequencies of the catch indicated a healthy fish population. In 1968, a gillnet set caught 27 cutthroat with average TL of 29.5 cm and a range of 15.7 to 47.7 cm TL. The gillnet data confirmed that Webb Lake supported self-sustaining fishery of unknown genetic make-up. Webb Lake in 1974 supported an estimated 300 angler-days.

EAST FORK OF THE NORTH FORK OF THE BLACKFOOT RIVER

Fish species present probably include westslope cutthroat and bull trout. Rainbow trout and Yellowstone cutthroat may be present but are not confirmed. This drainage is in need of extensive survey work for any definitive management plan to be developed.

Historical fish planting records revealed that this stream was planted several times between 1940 and 1952 with 4,000 to 12,000 2.5 cm undesignated cutthroat. The earlier plants originated from the hatchery in Ovando and the later plants came from the Anaconda hatchery.

Tributaries

Tributary streams of the East Fork of the North Fork Blackfoot include Sourdough, Meadow, East Fork Meadow, Mineral, Camp, Spaulding, Lost Pony, and Scotty creeks. Very little information is available for these streams.

Historical fish planting records indicate that Meadow Creek was planted several times between 1932 and 1952. The plants of undesignated cutthroat trout 2.5 cm long numbered between 6,000 to 42,000 annually. The planted fish originated from the Anaconda and Ovando hatcheries. In 1945, 12,000 rainbow trout 5 cm long were also planted in this creek.

Fish species expected to be present include: undesignated cutthroat, rainbow, rainbow x cutthroat hybrids, and bull trout. In the 1984 statewide pressure estimates, this stream had an estimated annual pressure of 594 angler-days.

Scotty Creek was planted in 1943 and again in 1948 with undesignated cutthroat 5 cm long from the hatchery in Ovando. The plants numbered about 2,000 fish each.

Lakes

The immediate watershed and shoreline area of several of the lakes in the drainage (e.g., Twin Lakes) were burned by the 1988 Canyon Creek fire and fish populations were reportedly affected. The exact nature and extent of the impact on the fishery has not been measured.

Meadow Creek Lake. This lake has a surface area of 5.1 ha with a maximum depth of 1.0 m. The lake was formed by a valley recessional moraine. No scientific data collections have been made on the lake. The cutthroat trout found in this lake are suspected to be Yellowstone cutthroat. This lake receives an estimated annual fishing pressure of about 100 angler-days. The naturally reproducing population could sustain more angling pressure but shoreline impacts would probably accompany the increased pressure. Historical fish planting records revealed several fish plants between the years 1932 to 1952. A total of 500,000 undesignated cutthroat and 29,280 rainbow trout were planted in 1937. The cutthroat originated from both the Anaconda and Ovando hatcheries and the rainbow from the Ovando station.

Upper Twin Lake. This lake has a surface area of 2.6 ha and a maximum depth of 3.0 m. The lake drains into an unnamed tributary to the East Fork of the North Fork Blackfoot River. The lake has never been stocked. This lake is accessible by trail 13 miles up Meadow Creek trail. In 1968, a single overnight gillnet set caught 17 undesignated cutthroat ranging in size from 17.8 to 55.9 cm long. In 1985, a fisherman reported numerous fish between 5.0 and 30.5 cm long. The species would probably be similar to the lower Twin Lake population which is suspected to be Yellowstone cutthroat. MDFWP planted 4,000 westslope cutthroat trout in Upper Twin Lake in 1989.

Lower Twin Lake. This lake has a surface area of 6.3 ha and a maximum depth of 3.0 m. The lake drains in an unnamed tributary of the East Fork of the North Fork Blackfoot River. Abundant undesignated cutthroat populate this lake with natural reproduction. The cutthroat that inhabit this lake are suspected to be Yellowstone cutthroat that were probably introduced with the fish plants of 1950 and 1952. Historical planting records show that 3,600 and 10,000 2.5 cm long cutthroat were planted respectively in 1950 and 1952. The fish came from the Anaconda hatchery.

Parker Lake. This lake has a surface area of 8.9 ha and is formed by a recessional moraine. The maximum depth of the lake is 1.3 m. Visual and angler surveys of the lake described the population of cutthroat trout as abundant. The naturally reproducing population of cutthroat in Parker Lake are suspected to be Yellowstone cutthroat. Fish planting records indicate that from 3,000 to 6,000 undesignated cutthroat were planted per year between the years 1942 and 1952. The planted fish originated from the hatchery at Ovando. The estimated annual fishing pressure is 100 angler-days. Parker Lake is accessed by trail 16 km from the trailhead at Indian Meadows.

NORTH FORK OF THE BLACKFOOT RIVER

This stream is the largest of the tributaries to the Blackfoot River. A major falls forms a natural barrier to upstream fish movement 9.6 km above the wilderness boundary. The North Fork supports a significant fall run of large fluvial bull trout from the Blackfoot and is suspected to have a resident population in addition to the migratory fish. The wilderness portion of the North Fork also supports a population of cutthroat trout of an undesignated species and may have some rainbow and/or Yellowstone cutthroat. MDFWP counted 11 and 12 bull trout redds, respectively, in 1988 and 1989. A key area is from the crossing below the North Fork guard station to the first falls.

Historical fish planting records show the river was planted throughout the period 1932 to 1954. The plants were made with both rainbow and undesignated cutthroat and numbered from 2,000 to 22,000 annually. The fish originated from the hatcheries in Anaconda and Ovando.

Tributaries. Tributaries of the North Fork Blackfoot River include Jakey, Cabin, Canyon, Dwight, South, Sorgo, Theodora, Cooney, Broadus, Eagle and Dabrota creeks, and the Dry Fork of the North Fork. Very little fisheries information exists for these streams. The Dry Fork was planted from 1928 to 1952 with 6,000 to 10,000 undesignated cutthroat 2.5 cm long. Cabin Creek was planted in 1952 with 6,000 undesignated cutthroat from the Anaconda hatchery. Cooney Creek was planted with 20,000 rainbow trout in 1941 and 4,000 undesignated cutthroat in 1950 from the Ovando hatchery. Dabrota Creek was planted in 1950 with 3,600 undesignated cutthroat 2.5 cm long from the Ovando hatchery.

No productive lakes exist in the drainage within the BMWC.

EAST FRONT DRAINAGES

North Fork Sun River

The North Fork of the Sun River originates along the continental divide and flows south to its junction with the South Fork of the Sun River at the head of Gibson Reservoir (Figure 9). The upper portion of the North Fork drainage and the entire west side of the drainage is timbered, while grass-covered hills follow the east side of the lower portion of the drainage. The summer flow of the North Fork ranges from 100 to 150 cubic feet per second (cfs).

Major tributaries of the North Fork Sun River include Headquarters, Rock, Biggs and Moose creeks. Summer flows in tributaries to the North Fork range from 5 to 50 cfs. Three of the ten mountain lakes in the North Fork drainage support fish populations.

South Fork Sun River

The South Fork of the Sun River flows north from its origin on the continental divide to the junction with the North Fork at Gibson Reservoir. The drainage is timbered except for a meadow section at Pretty Prairie. Summer flows in the South Fork range from 100 to 150 cfs. The West Fork is the largest tributary in the drainage. One of the five mountain lakes in the drainage within the BMWC supports fish.

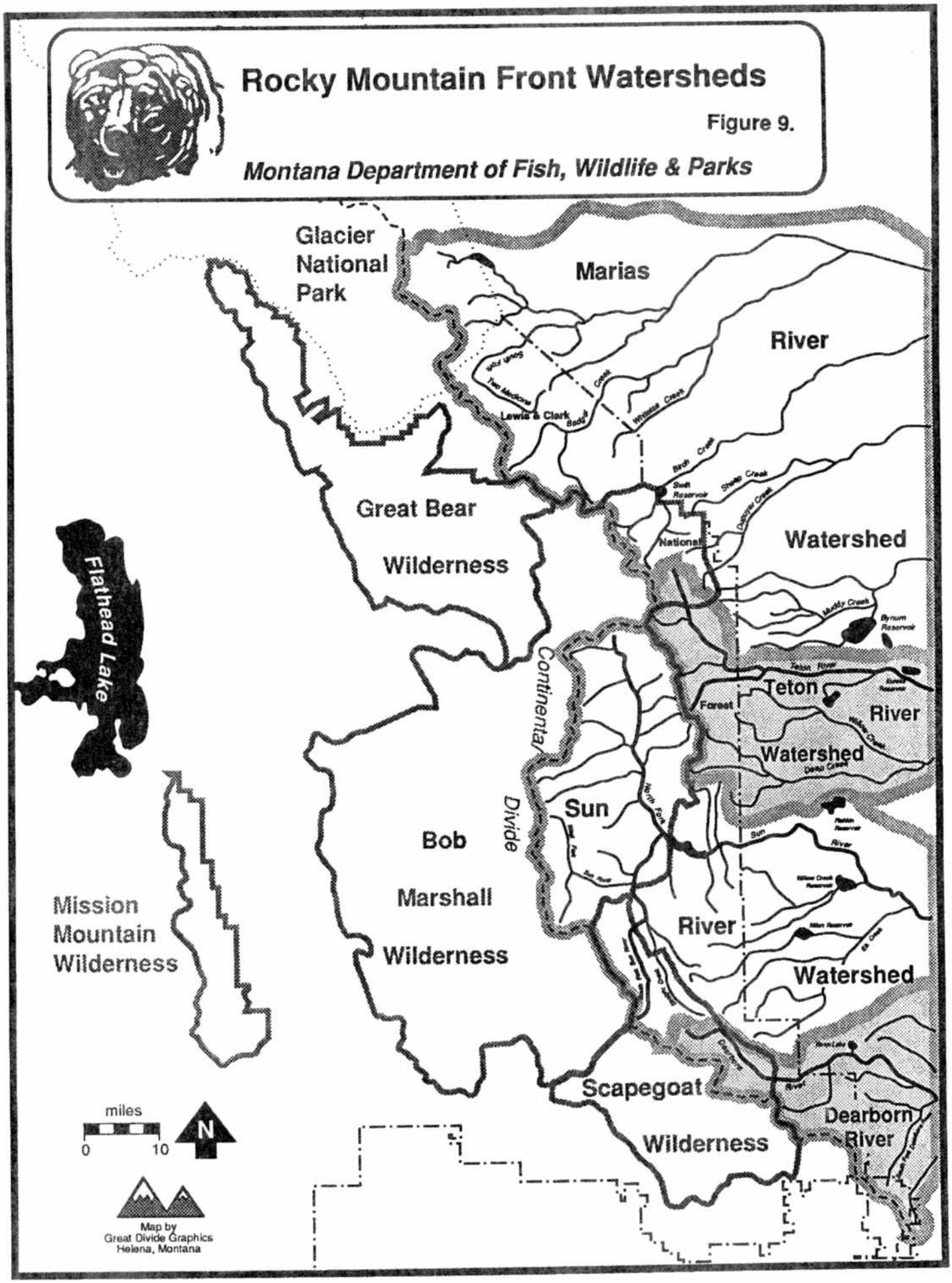
Dearborn River

The Dearborn River originates along the continental divide near Scapegoat Mountain and flows east-southeast to the downstream BMWC boundary. In the upper portion of the drainage, the stream meanders through a timbered floodplain. In the lower reaches, the Dearborn flows through a steep-walled canyon. There are no mountain lakes in the drainage which support fish.

Streams in the Great Bear Addition

There are eight major streams in the proposed Great Bear addition. Tributaries in the Marias drainage include the North, Middle and South Forks of Birch Creek, and the North and South

Forks of Dupuyer Creek. Streams in the Teton drainage include the North and East forks of the Teton River, and Bruce Creek. Impacts of the 1964 and 1975 floods are still evident in all these drainages. There are no mountain lakes in the drainages.


Rocky Mountain Front Watersheds
Figure 9.
Montana Department of Fish, Wildlife & Parks
Glacier National Park
Marias River Watershed
Great Bear Wilderness
Flathead Lake
Continental Divide
Teton River Watershed
Sun River Watershed
Bob Marshall Wilderness
Mission Mountain Wilderness
Scapegoat Wilderness
Dearborn River Watershed
miles
0
10
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Map by
Great Divide Graphics
Helena, Montana

FISH POPULATIONS

North and South Forks of the Sun River

Fisheries information is limited on the forks of the Sun River within the BMWC. Most of the information was gathered to assess the effects of the two fish angling limit (1975-1983) on the trout population in the forks. After 1983, the general stream limit for the BMWC applied (three fish, none over 12 inches).

Average lengths of rainbow trout in the North Fork Sun River from 1975 to 1989 ranged from 9.8 to 12.2 inches (249 to 310 mm). Lengths of rainbow trout in the South Fork Sun River ranged from 10.9 to 12.7 inches (277 to 323 mm) (Table 39). Other species present on the forks include cutthroat trout, hybrids of cutthroat and rainbow trout, and eastern brook trout.

Table 39. Length frequency of rainbow trout (and Rb, Ct, RbxCt in 1989) in the North and South forks of the Sun River from hook-and-line surveys (Expressed as percent of the total trout sampled).

Length group greater than or equal to	1975	1976	1977	1978	1979	1983	1985	1989
North Fork								
10 inches (254 mm)	70.6	74.0	81.0	92.1	67.1	77.0	82.0	45.0
11 inches (279 mm)	54.4	59.4	66.0	81.7	52.1	63.0	67.0	30.0
12 inches (305 mm)	29.4	41.7	51.0	68.3	37.0	39.0	42.0	18.0
13 inches (330 mm)	17.6	22.9	34.0	35.7	20.5	15.0	22.0	4.0
Number of fish in sample	68	96	41	126	73	73	75	67
Average length (all fish)	10.9	11.3	11.5	12.2	10.7	11.3	11.6	9.8
South Fork								
10 inches (254 mm)	71.2	80.0	91.0	80.8	86.0	88.0	87.0	79.0
11 inches (279 mm)	56.0	63.3	84.0	64.2	64.7	79.0	75.0	50.0
12 inches (305 mm)	40.8	50.5	79.0	49.5	44.1	46.0	48.0	28.0
13 inches (330 mm)	30.6	24.8	51.0	37.9	29.4	18.0	39.0	10.0
Number of fish in sample	59	102	70	95	68	82	61	104
Average length (all fish)	11.4	11.8	12.7	11.8	11.6	11.8	12.2	10.9

Rainbow trout generally reach 10 inches (254 mm) in the forks of the Sun River during their third year of life (Tables 40 and 41). By their fourth year, rainbow exceed 12 inches in both forks.

Table 40. Length range and age class distribution of trout in the North and South forks of the Sun River, July 31 - August 1, 1979.

Stream	Species*	Number of Fish	Length Range (Avg)	Age Class	Number of Fish	Length Range
North Fork	Ct	12	7.5 - 12.0 (9.7)			
	Eb	2	6.0 - 7.0 (6.5)			
	RbxCt	4	8.9 - 16.2 (12.3)			
	Rb	73	5.3 - 14.5 (19.7)	I	10	5.3 - 8.6
				II	20	8.1 - 11.0
				III	42	9.3 - 14.5
South Fork	Ct	3	7.1 - 9.6 (8.7)			
	Eb	5	7.1 - 9.0 (7.8)			
	RbxCt	2	9.9 - 11.2 (10.6)			
	Rb	68	5.7 - 17.5 (11.6)	I	5	5.7 - 8.4
				II	17	7.8 - 12.2
				III	46	10.0 - 17.5

* Species abbreviations: Ct - cutthroat trout; Eb - brook trout; RbxCt - rainbow/cutthroat hybrid; Rb - rainbow trout.

Table 41. Calculated growth (in inches) of rainbow trout from the forks of the Sun River, August, 1975.

	Average Age Group	Age of Fish	Total Length at Each Year of Life I	II	III	IV	V
North Fork Sun River	I	6	4.4				
	II	11	3.7	7.0			
	III	30	3.8	7.2	9.7		
	IV	15	3.2	5.9	9.5	12.0	
	V	2	2	2.9	6.4	9.3	12.1 13.6
	Averages	64	3.6	6.8	9.6	12.0	13.6
South Fork Sun River	I	5	4.4				
	II	9	4.0	7.6			
	III	12	3.9	7.1	9.8		
	IV	12	3.9	6.9	10.3	12.9	
	Averages	38	4.0	7.1	10.1	12.9	

A preliminary snorkel estimate (see Appendix Report for methods) conducted on the South Fork Sun River on August 3, 1987, indicated a rainbow trout population of 191 fish in a 1.05 mile (1.68 km) section from Burnt Creek to Deer Creek. However, because of the physical characteristics of the stream section, the estimate was thought to be a minimum value.

MDFWP conducted a snorkel estimate on the South Fork Sun River from Windfall Creek to Bay Creek (1.061 mi) on August 11, 1989. Snorkelers estimated 908 fish in the section, or 856 fish per mile, rainbow and cutthroat trout combined.

Grayling were introduced in Rock Creek in the North Fork Sun River drainage in 1984. Survival and status of the plant are unknown. Some grayling have moved downstream to the North Fork.

Very little information exists on mountain lakes in the drainage within the BMWC (Table 42). Mean lengths of yellowstone cutthroat trout ranged from 10.1 to 14.2 inches in the four lakes with fish populations.

Table 42. Information on lakes in the Sun River drainage within the BMWC (all lakes contain yellowstone cutthroat).

Lake	Date of Survey	No. of Fish	Mean Length (inches)	Mean weight (pounds)
Bear (natural reproduction)	7/19-20/65	6	13.5 (12.8 - 13.9)	0.76 (0.63 - 0.84)
	8/11/76	4	14.2 (11.8 - 15.7)	---
Levale (natural reproduction)	7/21-23/65	36	10.1 (7.8 - 12.2)	0.36 (0.15 - 0.60)
Sock (planted every other year)	7/26/82	7	11.6 (10.0 - 14.7)	---
Unnamed (natural reproduction)	7/24/82	5	13.2 (9.7 - 18.5)	--

In 1988 and 1989, MDFWP conducted a creel card angler survey in the drainage (Table 43). Anglers surveyed fished 274 hours in 1988 and caught 336 rainbow, 91 cutthroat, and 69 brook trout. Species composition was similar in 1989. However, the catch rate for rainbow trout was more than twice as high in 1989.

Dearborn River

Almost no fisheries information is available for the Dearborn River within the BMWC. Reports indicate a viable fishery for rainbow and cutthroat trout. Whitetail Creek, a major tributary, contains cutthroat trout.

Streams In the Great Bear Addition

Limited information is available on these streams. Cutthroat were introduced in the South Fork of Birch Creek below Crazy Creek (near Pinto and Circus creeks) in 1974. In 1979, cutthroat ranging from 5 to 12 inches were captured in the section.

Cutthroat trout ranging from 7.7 to 10.0 inches in length were sampled in the North Fork of Birch Creek in 1971. In the North Fork of Dupuyer Creek, cutthroat (7.6 to 10.5 inches) and eastern brook trout (6.5 to 10.6 inches) were sampled in 1976. In the South Fork Dupuyer Creek, cutthroat from 2.3 to 9.8 inches were sampled in 1976.

Table 43. Results of a creel card angler survey on the Sun River drainage. Almost all anglers fished the north and south forks of the Sun River.

	1988	1989
Number of angler trips surveyed	40	26
Number of angler hours	274	124
Percent outfitted	23	10
Percent fished river	92	92
Percent fished creek	0	0
Percent fished lake	8	8
Tackle used (percent):		
Flies	38	40
Lures	0	5
Bait	5	0
Combination	50	25
No information	7	30
Westslope cutthroat caught:	91	74
number per hour	0.3	0.6
percent kept	21	11
percent > 12"	39	31
Brook trout caught:	69	39
number per hour	0.25	0.31
percent kept	3	3
Percent > 12"	0	3
Rainbow trout caught	336	350
number per hour	1.2	2.81
percent kept	18	6
percent > 12"	15	32

FOUNDATION ISSUES

Before addressing the goals of this planning process, it is important to identify the basic principles upon which the plan will be built. These items have been designated "Foundation Issues." These topics have been discussed throughout the planning process and they are generally accepted as valid. Six foundation issues form the basis for developing the fish and wildlife goals for the Bob Marshall Wilderness Complex. It is again acknowledged that the focus of these issues, and eventually the goals and strategies of the planning process, remains on elk and the other game species of fish and wildlife. This does not reflect a lack of interest or concern for other species occupying the BMWC ecosystem. What it does reflect is that elk and other game species have been the focus of conservation efforts in this region since the turn of the century and that this effort has been successful.

The six foundation issues are:

I. *Fish and game populations exist in a managed situation and environment that, while not pristine in a strict sense, is consistent with wilderness resource goals.*

This foundation issue recognizes two important points. First, the fish and wildlife resources may be considerably different from what they were under the pristine circumstance. Archeological evidence suggests that hunting, and traveling to hunting grounds along the Rocky Mountain Front, occurred in the BMWC ecosystem. This activity involved most species found there today and bison. The limited historical information available indicates a wildlife abundance on the northern plains that was systematically consumed by pioneer markets for hides, meat and bones. There was also indication of a scarcity of game in the mountainous country to the west of the great plains. By the turn of the century, wildlife populations in the mountains and on the plains were little more than remnants. Hungry Horse and Gibson Dams have altered aquatic systems and exotic species have been introduced into the area.

A second important point that needs to be noted is that conservation programs have restored substantial populations of wildlife and introduced new species of fish. These fish and wildlife populations are not a restoration of the original condition. The current fish and wildlife populations are the result of protection and management programs practiced both in and around the classified wilderness land. These programs were instituted long before passage of the Wilderness Act.

II. *Fish and wildlife planning must be approached in an ecological context, boundaries being dictated by the animals' needs. Those boundaries go beyond classified wilderness and, at times, beyond national forest boundaries.*

The BMWC ecosystem has been defined on the basis of elk distribution (Fig. 1). Although most of the elk summer ranges are within the classified wilderness, the species cannot prosper without protection for the land that sustains them in all seasons. The data base for elk distribution is substantial and supports a broad definition of the BMWC ecosystem. This definition is generally adequate for most other species considered in this analysis. The ecosystem definition is also reasonable from a fisheries perspective, with the exception of the exclusion of Flathead Lake.

Elk distribution defines a BMWC ecosystem of about 4 million acres (Fig. 1). The USFS manages 74% of the ecosystem. The next largest landowner is the private sector with 17%, followed by the State of Montana with 4%. Only 1% of this 4% is under the Montana Department of Fish, Wildlife and Parks (MDFWP) management. The remaining 5% includes: corporate lands, the Bureau of Land Management (BLM), the Blackfeet Indian Reservation, and Glacier National Park (GNP). Slightly more than half of the USFS lands (53%) are presently designated wilderness. This arrangement of land ownership and resource-management responsibility emphasizes the need to approach wildlife planning in an ecological context and with a cooperative attitude.

III. *Hunting and fishing will be wilderness oriented and emphasize primitive recreation within the BMWC ecosystem. A diversity of recreational experiences will continue to be offered within this primitive setting.*

The type of recreational areas most limited in Montana and elsewhere are places offering the primitive recreation experience. Places to hunt and fish in developed settings are already abundant and will increase as other public lands are further developed. Preservation of sites for primitive forms of recreation must occur both within and beyond wilderness boundaries if those forms of recreation are to be sustained.

Within this context, there will continue to be a high degree of diversity of opportunity. Archery seasons, early-rifle seasons and general seasons in addition to permit hunting, branch-antlered bull hunting and either-sex seasons will likely be part of the evolving management formula.

While the recreational emphasis will be on primitive backcountry activities within and around the wilderness,

season dates and types will be set to assure the perpetuation of game populations throughout the ecosystem.

IV. *Wildlife and fisheries management will strive to maintain population age structures approaching those occurring in pristine populations.*

Fish and wildlife management will emphasize the intrinsic values of fish and wildlife and the esthetics of the recreational experience. This emphasis will be more important than striving to achieve the maximum number of recreation days or the maximum rate of game harvest in the BMWC ecosystem. This emphasis is consistent with the Wilderness Act, the philosophy of those who were active in the movement that produced the Act, and contemporary users of the area. The present planning direction of the MDFWP for the elk population of this area is to maintain a diverse age structure in the bull segment of the herd. This planning direction is consistent with this foundation issue.

V. *Fish and wildlife recreational opportunities include hunting, fishing and appreciating their intrinsic values.*

The consideration of both consumptive and nonconsumptive uses and values of fish and wildlife are compatible and consistent with the traditional use of the area. These varied uses of fish and wildlife are also consistent with the Wilderness Act, the philosophy of the founders of the wilderness concept, and contemporary fish and wildlife management programs.

VI. *Individual perceptions of what the wilderness is, and what the recreational experiences in the wilderness are or should be, ought to be a consideration in the planning process. Fish and wildlife programs for the BMWC ecosystem, likewise should address user perceptions.*

Wilderness users and wilderness resource managers all have perceptions of what these areas are and what the human experiences related to them mean. These perceptions are probably as varied as the individuals who hold them and more diverse than the land that nurtures them. It was noted early in this planning process that Aldo Leopold counseled, "To promote perception is the only truly creative part of recreational engineering." The entire Limits of Acceptable Change (LAC) process is, in a sense, "recreational engineering." The perceptions of those using the BMWC ecosystem and those managing its resources need to become a visible part of this process. People's perceptions of what is wilderness and what type of recreational experiences can be expected in wilderness, will be discussed throughout the LAC process.

FISH AND WILDLIFE PLANNING GOALS AND STRATEGIES

The planning goals for the fish and wildlife resource of the BMWC ecosystem are presented for the species discussed in this process. The many other species living in this complex may benefit as more consideration is given to the featured species. It is important, however, that this not be assumed and forgotten. Programs need to be initiated that inventory and assess the condition of populations of other species inhabiting this wild land complex. At the same time managers and researchers must be sensitive to the need to minimize disturbance to land and animals in the wilderness. Research on species that do not exclusively inhabit wilderness areas should be conducted in the unclassified lands when that option is available. In this way, human disturbance of wilderness land and wildlife will be minimized.

WILDLIFE

Elk

It is the goal of this plan to maintain or improve elk population numbers, to sustain the current level of hunter opportunity, and to provide for the general public enjoyment. Some emphasis will be on providing mature bull elk in a backcountry setting. This goal includes increasing the elk population to compensate for expected wolf predation.

One of the purposes of this goal is to sustain or slightly increase the present hunter harvest of elk in the BMWC ecosystem while accepting some expected increase in predation with the recovery of wolves. To accomplish this, the base herd will have to be increased to produce enough additional elk to compensate for expected predation. This goal will be pursued with the following strategies:

1. Allow natural burns to occur according to prescription. In addition, consideration should be given to a prescribed fire policy within the ecosystem. These fires would be used to bring the ecosystem back into a natural vegetative mosaic which would have existed had fire suppression not been imposed the last 80 years.

The positive or negative consequences to wildlife would be accepted.

2. On winter ranges outside the wilderness boundary but within the BMWC ecosystem, elk habitat should be given priority in resource allocation.

3. Winter range acquisition and improvements should be pursued along the east and south perimeter of the BMWC. Emphasis should be directed south of the Dearborn River where publicly owned winter range is currently limited. This emphasis should include evaluating the effect of the 1988 fires on elk distribution and range use.

4. Cooperative efforts must be encouraged with the Blackfeet Tribe as they continue to develop their game-management program. There is considerable potential for improvement in the Badger-Two Medicine area.

5. The current program of creating and managing a vegetation disturbance regime that mimics natural disturbance and sustains early plant successional stages within the BMWC ecosystem outside the wilderness should be continued. This work on the South Fork Flathead River is sponsored under the Northwest Power Planning Act.

Mule Deer

It is the goal of this plan to provide for an unquantified increase in the mule deer population of the BMWC ecosystem through habitat manipulation outside the classified wilderness area.

Unlike the relatively stable elk populations, mule deer populations fluctuate considerably due to factors other than hunter harvest. Presently, elk are given management priority and this is generally expected to continue. When addressing mule deer, it is important to recognize differences in the management needs between the resident and migratory segments of the population. To sustain the current hunter harvest opportunity and accommodate increased predation, the habitat base suitable for mule deer needs to be improved or expanded. This goal will be pursued with the following strategies:

1. (The first strategy for mule deer is the adoption of the fire policy as described for elk.)

2. On winter ranges outside the wilderness but within the BMWC ecosystem, mule deer habitat needs should be given priority in resource allocation.

3. Vegetation manipulation outside the wilderness boundary will be conducted to favor plant species utilized by wintering mule deer where their key areas do not overlap important elk ranges.

White-tailed Deer

The goal of this plan for white-tailed deer is to have the population within the BMWC ecosystem fluctuate with the plant successional stages that affect their numbers.

The white-tailed deer populations have expanded within the wilderness with the maturing of old-age timber stands. At the same time, this habitat type has disappeared from managed timber lands around the wilderness but within the ecosystem. There is little evidence to suggest that whitetails migrate between the BMWC and adjacent timber lands within the BMWC ecosystem. Since there is little exchange between these areas, this plan will not address the needs of white-tailed deer beyond the wilderness boundary. The goal for white-tailed deer within the wilderness suggests no specific strategy.

1. Within the wilderness boundary, maturing forests are expected to sustain some white-tailed deer expansion. Natural burns will periodically recycle the vegetation community to the detriment of this species. This will be accepted.

Moose

It is the goal of this plan to encourage the expansion of moose throughout the BMWC.

Moose populations have demonstrated some expansion throughout the BMWC. This trend, perhaps now encouraged by plant successional changes initiated by the 1988 fires, can be maintained. This goal will be pursued with the following strategies:

1. Moose populations will be managed conservatively to maintain the gradual increase in populations that is apparently occurring.

2. The impact of wolf recovery on moose populations will be observed.

3. A fire policy within the wilderness, as described for elk, and a prescribed burn program outside the wilderness boundary will be pursued to assure proper vegetational stages for moose populations.

4. The impact of domestic grazing on riparian areas will be evaluated. Practices detrimental to balanced utilization of riparian vegetation will be modified if necessary to assure the production of forage normally utilized by moose.

Bighorn Sheep

It is the goal of this plan to manage bighorn populations and habitat to continue the recovery of this species and to expand their distribution, if possible, within the BMWC ecosystem.

The bighorn sheep population lives primarily along the eastern portions of the BMWC on wilderness and adjacent non-wilderness lands. Prior to 1983, the population peaked at about 1,200 animals but was reduced by disease to present levels. At the present time, there are about 900 bighorns in the Sun River segment of the population and about 100 living north along the Rocky Mountain Front. The goal for the Sun River segment of the bighorn population is to sustain a minimum of 800 bighorns having a recruitment rate of at least 30 lambs per 100 ewes and capable of providing a minimum of 40 3/4 curl rams for harvest annually. This goal will be pursued with the following strategies:

1. Continuation of the limited ram, limited ewe hunting season for the immediate future.

2. A fire policy within the wilderness as described for elk, and a prescribed burn program outside the wilderness boundary will be pursued to assure proper vegetational stages for bighorn sheep populations.

3. Evaluate habitat changes resulting from the 1988 burns and consider the transplant of bighorns into suitable historic range both within and outside of designated wilderness areas if natural dispersal fails to stock suitable habitat.

Mountain Goat

It is the goal of this plan to manage mountain goats to increase populations and distribution so that all available historic mountain goat habitat is filled, ultimately increase hunter opportunity, and to provide for the general enjoyment by the public.

Mountain goat habitat occurs "where you find it." Little can be done in the way of improving, manipulating or otherwise "creating" it. Because mountain goat terrain is fragile and goat behavior is inflexible, it is important that buffers exist to protect both the habitat and the animal from human disturbances. This goal will be pursued with the following strategies:

1. Within the wilderness boundaries, goat habitat is secure and the populations will be managed with conservative hunting seasons.

2. Emphasis will be on protecting habitats and herd units which do not occur within the existing wilderness boundary. In these areas, mountain goat habitat should be given top priority in resource allocation decisions.

3. Exterior to the wilderness, where island populations of goats are in jeopardy of being isolated, land-use decisions must favor maintaining linkages between island and main populations by avoiding human disturbance in or near travel corridors.

4. Distribution of mountain goats on historic and potentially suitable ranges, both within the wilderness and on associated non-wilderness lands, will be restored through management programs such as reintroduction (utilizing native stock), full protection and variable hunting seasons.

Mountain Lion

It is the goal of this plan to maintain mountain lion populations by maintaining the prey base that sustains them, primarily mule deer.

Little is known of mountain lion populations within the BMWC ecosystem other than that they exist and appear to be healthy. The objective will be to maintain productive and abundant ungulate

populations that typically support lion populations. The mountain lion goal will be pursued with the following strategies:

1. The strategies for maintaining the various ungulate populations that form the lion's prey base can be found under the individual goal and strategy discussions for each of those species.

2. A composite data base on mountain lions harvested from the ecosystem should be established to follow age and sex ratios of lions harvested. This data base would be used to avoid the over harvesting of females and to otherwise adjust harvest rates if necessary.

Black Bear

It is the goal of this plan to manage habitats that provide the opportunity for stable black bear populations.

Black bear populations are thriving in and around the BMWC ecosystem. The most productive populations are associated with the moist, west-side coniferous forests and berry fields. In some localized areas, with high grizzly bear densities, black bear populations appear depressed. This situation is natural and accepted. In most circumstances, measures taken to improve grizzly range will also benefit black bears. The black bear goal will be pursued with the following strategies:

1. Natural burns and prescribed fire should be promoted to create more edge and forage that favor bears.

2. Efforts should continue to elevate the public perception of the black bear. This species needs to be viewed as an animal that is an integral part of a healthy forested environment.

Grizzly Bear

It is the goal of this plan to manage the grizzly bear population and its habitat to continue and sustain the recovery of this species in the BMWC ecosystem.

The grizzly bear represents a truly wild vestige of primitive America that is being maintained in the wilderness setting of the BMWC ecosystem. The bear population has met or exceeded the recovery goals identified in the 1982 recovery plan. The responsible agencies are now considering taking the grizzly bear off the list of threatened and endangered species. Taking the bear

off the list, however, needs to be accompanied by creation of a process that assures the preservation or improvement of grizzly bear habitat within the BMWC ecosystem. It is also essential that bear management programs strive to maintain optimum population levels and current distribution throughout the ecosystem. This goal will be pursued with the following strategies:

1. The grizzly bear, like other species, is dependent on vegetative patterns established by precipitation, fire and plant succession. The fire policy described for elk and other species in this plan is appropriate for grizzlies within the wilderness. This impact of changing vegetative patterns is acceptable.

2. Education of recreation and other land users of the BMWC ecosystem in methods to minimize human/grizzly conflict should be emphasized.

3. Outside of the wilderness boundaries, grizzly bear habitat and security needs must be given priority consideration in resource allocation decisions.

Wolf

The goal of this plan is to accommodate the recovery of wolves in the BMWC ecosystem consistent with the objectives of the prey species that must sustain them.

Wolves have existed in and continue to extend their range into the BMWC ecosystem. Accomplishing and sustaining permanent recovery of this species depends upon sustaining a prey base for them to utilize and gaining broad public acceptance for their presence. Sustaining the prey base can be achieved by meeting the goals established in this plan for elk, mule deer, moose, mountain goats and bighorn sheep. Gaining public consensus for their permanent presence in the BMWC ecosystem will require developing a recovery program that allows for the management of wolves. Wolf management must include an emphasis on the condition of prey base, the shared utilization of that prey base, and the ability to kill or relocate wolves if necessary to keep their recovery in balance with other resource objectives. This goal will be pursued with the following strategy:

1. Promote a wolf management plan that includes maintaining and expanding the prey base, establishing recovery goals consistent with the capacity of the prey base to sustain wolves and hunting, and defining how competing demands for the various prey species will be resolved.

FISH

Westslope Cutthroat Trout

The goal of this plan is to maintain, at current or increased levels (as indicated by population estimates and angler success rates), the naturally reproducing populations of genetically pure westslope cutthroat trout in streams and lakes within the BMWC ecosystem. This goal includes the opportunity to catch and keep a small number of these trout for a wilderness subsistence experience.

Management of westslope cutthroat within the BMWC ecosystem should emphasize preservation of the population for its own values and emphasize a quality fishery over a production fishery. The ecosystem represents one of the major remaining strongholds of this species, so protection of the gene pool is critical. The goal for westslope cutthroat trout will be pursued through the following strategies:

1. Maintain the current angling limits of three fish, none over 12 inches in streams, and three fish with no size restrictions in lakes.

2. Protect the genetic integrity of westslope cutthroat by planting those fish over existing non-native fish species or by removing the exotic species from lakes within or draining into the BMWC.

3. Continue introductions of westslope cutthroat trout in selected lakes to establish genetically pure populations and to increase angling opportunity while protecting other resource values.

4. Protect fisheries habitat within, and in areas draining into, the BMWC. It is important to ensure no further degradation in vulnerable areas such as the Middle Fork Flathead drainage.

5. Manage trail systems in a manner consistent with the goals for westslope cutthroat trout with an emphasis on protecting water quality.

6. Isolating some areas by locating trails and stream crossings away from critical areas and isolating some areas by sustaining difficult or primitive access.

7. Increase enforcement of angling regulations through a cooperative effort between the USFS and MDFWP.

Bull Trout

The goal of this plan is to maintain, at current or increased levels (as indicated by redd counts), the naturally reproducing populations of migratory bull trout in streams and lakes within the BMWC ecosystem. This goal includes providing an opportunity for anglers to catch a trophy fish in a wilderness setting, but de-emphasizes harvest of this unique species.

This population of bull trout, living in a natural lake and migrating into an extensive and still largely accessible and unaltered headwater tributary system, is probably the only one of its kind left in the United States. Streams within the BMWC provide some of the most important spawning and nursery habitats for migratory bull trout in Flathead Lake and Hungry Horse Reservoir. Because of the ecological relationships within these expansive aquatic systems, management must be sensitive to conditions both within and beyond the BMWC. The goal for bull trout will be pursued with the following strategies:

too specific

1. Maintain the current angling limit of one fish per day and in possession. Consider an education program to encourage voluntary catch and release of only one mature fish per day. The stress of migration and spawning render this species very sensitive to angling. If necessary, further restrictions will be considered.

2. Protect fisheries habitat within and in areas draining into the BMWC. It is important to ensure no further degradation in vulnerable areas such as the Middle Fork Flathead River.

3. Locate trail crossings away from important spawning areas and maintain primitive or difficult access to critical habitat areas.

4. Increase enforcement of angling regulations through a cooperative effort between the USFS and MDFWP.

5. Encourage management of bull trout in a manner consistent with this goal outside the BMWC. Sound management of this species in Flathead Lake, Hungry Horse Reservoir and the river

corridors is required to protect the species within the BMWC ecosystem.

Other Game Fish

The goal of this plan is to emphasize recreational opportunity, primarily east of the continental divide, on populations of rainbow trout, brook trout, yellowstone cutthroat trout and mountain whitefish.

The primary emphasis of the fishery program is to favor native species in the BMWC. In this instance, it is done by focusing angling pressure on non-native fish. The whitefish is an under-utilized native fish that could absorb more angling pressure. The objective is to reduce the taking of native cutthroat and bull trout. Rainbow trout, brook trout, Yellowstone cutthroat trout and whitefish should be able to support increased angling pressure, provide more recreational opportunity and perhaps reduce pressure on westslope cutthroat and bull trout. The goal for these species will be pursued through the following strategies:

Easily outdated

1. Consider increasing the angling limit on rainbow trout in the Sun River drainage.

2. Develop and implement an education program to emphasize harvest of mountain whitefish for a subsistence experience within the BMWC.

3. Ensure that the management and education programs for these fish species are developed complimentary to the dominant fishery goal of preserving the westslope cutthroat and bull trout fish populations.

WILDERNESS USER PERCEPTIONS

The goal of this plan is to devise a methodology to address and deal with human perceptions of wilderness and the wilderness experience.

Most of the effort committed to this process has been directed toward the physical (land condition) and biological (fish and wildlife) resources of the BMWC ecosystem. Just as beauty and its identification belong to each person individually, the perception of what wilderness is and the experiences we seek there vary across a wide spectrum. If we are to follow Leopold's suggestion that, "To promote perception is the only truly creative part of recreation engineering", then we must devise ways to deal with

perceptions as well as realities. The ultimate goal will be to bring perceptions and reality as close together as possible so that wilderness, and the experiences we have there, are as genuine and fulfilling as possible.

Dealing with something as elusive and private as how people intuitively and instinctively relate to wilderness might be approached in two ways. First, an effort needs to be made to sample the spectrum of perceptions or expectations held by users of the BMWC ecosystem. This sampling should include both what the individual thinks the wilderness is, and what each person would like it to be. Second, a program should be developed that enriches the physical and intellectual environment in which ideas about wilderness and our relationship to it are formed. The first suggestion initiates a process of learning about contemporary feelings held by wilderness users which could be both enlightening and valuable to resource managers. The second suggestion approaches Leopold's idea of dealing with perceptions as a means of initiating "recreation engineering" as the only creative aspect of recreation management. The goal of dealing with wilderness user perceptions will be pursued through the following strategies:

1. Design and implement a study of the perceptions of wilderness experiences, expectations and management held by people interested in the preservation and use of the BMWC ecosystem.

2. Continue the LAC planning and implementation process as a means of preserving the physical environment in which wilderness perceptions will be formed.

3. Design and implement an educational program that develops and disseminates information about the philosophy and history of the wilderness movement and the BMWC ecosystem. This program will enrich the intellectual environment in which wilderness perceptions will be formed.

4. Integrate user perceptions and expectations into management plans for the BMWC ecosystem.

AFFIRMATION OF WILDERNESS MANAGEMENT CONCEPTS

The Wilderness Act speaks to wildlife only once, and in that reference, Section 4 (d) (8), it assures that "Nothing in this Act shall be construed as affecting the jurisdiction or responsibilities of the several States with respect to wildlife and fish....". It is incumbent upon wilderness resource managers however, to approach the management options for the BMWC ecosystem; within the context of the Act, consistent with the definition of wilderness, cognizant of the philosophy of those responsible for the Act, and aware of the conservation history of the land.

The BMWC ecosystem extends well beyond the boundaries of wilderness covering an area at least twice as large as the presently classified lands. This planning process suggests that it is both possible and desirable to approach fish, wildlife and habitat management, within the major portion of this ecosystem, consistent with the philosophy of wilderness and the spirit of the act.

There is a persistent notion about wilderness and wilderness ecosystems that often implies a static circumstance. The wildlife history of the BMWC ecosystem reflects a very dynamic situation. Moreover, changes in wildlife (game species) populations are the result of aggressive (game range acquisition) and passive (regulation) management programs. These, induced changes, are most evident on the eastern edge of the BMWC ecosystem where conservation programs are expanding wildlife populations and extending their ranges out through the foothills, and riparian areas of the northern plains. These activities (acquisitions, leases and easements) are beginning to extend effective habitat into the area of wildlife's greatest historical abundance.

Conversely, there are areas within the BMWC ecosystem where wildlife habitat, and its wildland character are threatened. Oil and gas exploration, timber sales, transportation plans and other habitat altering prospects have the potential to compromise wilderness associated wildlife habitat. Thus there is a dynamic tension at work within the BMWC ecosystem. It is a tension that can be managed to the benefit of fish and wildlife resources. Changes in the ecosystem can be kept within acceptable limits through adoption of wilderness management concepts along with pursuit of the Fish and Wildlife Planning Goals identified in this plan. Application of this management direction throughout the ecosystem should insure the security of fish and wildlife and the recreational experiences associated with them.

Wilderness and its management concepts are laid out in Section 2 (c) of the Act where it states,"...an area...retaining its primeval character and influence...which is protected and managed ...to preserve its natural conditions...", where there are, "...outstanding opportunities for solitude or a primitive and unconfined type of recreation...". The BMWC ecosystem management program can meet these expectations. These criteria are being met within the wilderness areas. Traditional and contemporary fish, wildlife and habitat conservation activities beyond the wilderness boundaries are consistent with the , "...public purposes of recreational, scenic, scientific, educational, conservation and historical use.", described in Section 4 (b) of the Act. Planning goals and strategies identified in this plan likewise conform to the concepts defined in the Act.

WILDLIFE INDICATORS, STANDARDS AND GUIDELINES

The hunting traditions within the Bob Marshall Wilderness Complex (BMWC) date back to subsistence hunting by Native Americans. Historically, the BMWC was one of only several areas in Montana that provided sport hunting for elk. Recreational opportunities afforded by the elk resource today are among the best and most sought after in America. This section describes current elk management, biological indicators and standards, and further management actions that may be needed to maintain those standards.

A Review of the Resource

The 6,250 square mile BMWC, as defined by the needs of elk, straddles the Continental Divide and includes the Bob Marshall, Great Bear, and Scapegoat Wilderness areas and adjacent federal, state, and private land. It encompasses portions of five ranger districts on the Lewis and Clark, Flathead, Helena and Lolo National Forests, as well as 18 hunting districts in Fish, Wildlife and Parks administrative regions 1, 2, and 4.

More than 80% of the 9,000 to 11,000 elk in the BMWC use wilderness habitats some time during the year and occupy at least 40 different winter ranges. However, 65% of the available winter range is outside wilderness boundaries and nearly 80% of the elk that summer in the wilderness migrate out to these non-wilderness winter ranges. Whereas private lands comprise only 21% of the land-base, 42% of the elk winter range is under private ownership. Privately owned winter and spring ranges predominately occur along the East Front and throughout the Blackfoot, Clearwater, and Swan valleys. The number of elk that can occupy these areas is dictated, in part, by these land ownership patterns and landowner tolerances. In addition, different portions of this very large unit have different potentials for raising elk. The elk that occupy the south and east sides of the complex consistently have higher calf survival than do the elk that live in the Middle Fork of the Flathead, deep within the BMWC. Conversely, the bull elk within the wilderness appear to have higher rates of survival through the hunting season than those in non-wilderness areas.

The entire BMWC is within the designated recovery zone for the northern rocky mountain gray wolf. If recovery goals for this species are met, a minimum of 50 wolves are anticipated to

occupy the complex. Wolf distribution is expected to coincide with the distribution of big game, and it is assumed that wolf predation will be additive to current hunting mortality.

The BMWC accounts for 12% of Montana's statewide total elk and total bull harvest, and 14% of the branched-antler bull harvest. It also provides hunting for 13% of the state's elk hunters and 7% of the hunter days of recreation. Annually, some 12,000 hunters spend 72,000 days afield and harvest about 1,100 antlered and 800 antlerless elk. Recent bull harvests have been variable and have ranged from 50-60% yearlings in HD 285 to 20-30% yearlings in HD 150.

The BMWC provides a diversity of non-hunting recreational opportunities associated with elk in the midst of wilderness. Opportunities range from viewing solitary bulls in high alpine avalanche chutes to the massive concentrations of wintering elk on the Sun River and Blackfoot-Clearwater wildlife management areas. The Sun River Preserve allows for easy viewing of elk during the rut.

The Goal

The general goal is to manage elk populations and the recreation resource to provide a variety of experiences in hunting and general enjoyment by the public. Emphasis will be placed on providing mature bull elk in back-country settings.

Indicators and Standards

In order to achieve this goal, the following indicators and standards are offered as a systematic means to that end.

1. Maintain the current distribution of elk over three million acres of occupied habitat.

2. Maintain a minimum of 9,000-11,000 elk within the complex.

3. Maintain an observed late-winter ratio of at least 20-30 bulls per 100 cows.

4. Maintain a minimum observed late-winter ratio of at least one branched-antler bull per spike.

5. Maintain elk harvests distributed in time throughout the hunting season, with a maximum of 40 percent of the total bull harvest occurring the first week of the season.

6. Maintain a bull harvest comprised of at least 60 percent branched-antler bulls, and 15-25 percent of the animals 4.5 years or older.

7. Provide for an annual harvest of at least 1,000 antlered elk and 1,000 antlerless elk.

Management Actions

High priority habitat management actions are natural and prescribed fire on wilderness and non-wilderness public lands, aggressive road and trail management, development of additional walk-in hunting areas, more aggressive pursuit of Bonneville Power Administration (BPA) mitigation efforts in the South Fork of the Flathead, development of cooperative livestock grazing programs, close monitoring of and participation in of oil, gas, and mineral development, and coordination with other wilderness management. Additional new road construction into unroaded lands is discouraged.

If wolves are to be included back into this complex, conservation easements and land acquisition must be pursued on key wintering areas along the East Front of the Rockies, the Blackfoot, Clearwater, and Swan valleys, and the Middle Fork of the Flathead River.

Negotiations and cooperative management programs will be pursued with the Blackfeet Indian tribe to increase elk populations in the Badger-Two Medicine area.

The general hunting season framework, except for the totally Wilderness hunting districts (HDs 150, 151, and 280) will be five weeks long. The total elk population will be maintained at a stable level using a combination of either-sex hunting, special antlerless permits, and A-7 (antlerless-only) licenses. Local sub-populations that cause chronic game damage will be addressed with localized special seasons or additional antlerless permits and A-7 licenses. By increasing antlerless harvest on non-migratory, "problem" elk causing game damage, migratory herds in more remote habitats may increase somewhat without increasing negative impacts to landowners or the winter ranges.

A breakdown of population management actions at the hunting district level is as follows:

Elk will be increased in the Swan (HD 130) under the current any-bull season. Antlerless permits or A-7 licenses will be initiated and increased as the population increases.

Elk numbers will be increased slightly in HD 140 and HD 141 under the current season type. Populations could be regulated with antlerless permits or A-7 licenses, instead of either-sex hunting, to foster populations. Increased habitat security, through recent road closures, should slow the rate of female harvest over what was observed in the 1980s.

The traditional early rifle season in HD 150, 151 and 280 will be continued under current regulations. The population will be closely monitored to determine if it meets stated objectives. Alternatives include a later starting date (ex. October 1) or earlier closing date (ex. November 1) or antler point restrictions. An evaluation of the experimental BTB season in HD 280 will be used to determine success of such seasons in a backcountry area.

In HD 282 and HD 285, elk populations will be held stable using antlerless permits or A-7 licenses during the general season. Bulls will be hunted in HD 285 under existing and new road management programs with cooperating landowners. Hunting in HD 282 during the first three weeks of the general season will be regulated to help keep bulls from seeking refuge in this permit-only district.

Many elk are shared between HD 280, HD 281, and HD 422. Whereas the wintering elk population has grown in HD 422, none of the Elk Management Unit's objectives for bulls are currently being met in any of the districts. As stated above, the experimental BTB season in HD 280 and HD 281 will be evaluated to determine if the objectives can be met. Bulls in HD 281 will be regulated in the general five-week general season, and along with aggressive road management in the Kershaw Mountain and Ovando Mountain areas. In HD 422, where most of the wintering elk summer west of the divide, the management will be aimed at stabilizing this population at 500 animals. The population levels are primarily dictated by landowner tolerance as most of the elk winter on private land. Access to public land is also limited due to landownership patterns and rugged terrain. Liberal either-sex hunting will continue to control this migratory elk herd until winter range is secured by easement, lease, or acquisition, or until hunter access is improved, or the distribution of wintering elk changes. As a result of the 1988 Canyon Creek fire, winter ranges on U.S. Forest Service lands are expected to become more attractive to elk. If this occurs, the hunting regulations will be restricted to accommodate a population increase on public land.

The aim of management in the Sun River is to maintain a wintering population of 2,500 elk. Population numbers will be regulated through the use of harvest quotas. Hunting seasons will be constructed to reduce the bull harvest from current levels with the objective of retaining older aged bulls. This

will require reducing the bull harvest from 50% of the quota to 35-40%. This may be done through restricting the first portion of the season to antlerless-only, followed by either-sex hunting until the quotas are reached.

Quotas for the area will continue to be set based upon the number of animals observed on winter ranges, summer production surveys, forage production on winter ranges, and harvest information from the Augusta Game Check Station. Lesser quota adjustments of up to 100 animals will be made annually based on these parameters. Quotas will be substantially reduced (by 200 or more) if:

(1) 2,200 or fewer wintering animals are observed for three years and adequate forage exists to support more;

(2) if new winter range is secured;

(3) if permanent changes (three years or more) are noted in wintering patterns, or;

(4) if less than 60 percent of the elk forage base produced on the Sun River Wildlife Management Area (SRWMA) is utilized for two consecutive years.

Quotas will be substantially increased (200 or more), if:

(1) utilization of the elk forage base on the SRWMA exceeds 85 percent for a three-year period;

(2) forage production on the SRWMA falls below that required to supply 12,000 elk-months of utilization for two consecutive years;

(3) private lands receive heavy elk depredation, or; (4) calf production falls below 30 calves per 100 cows for three consecutive years.

The elk herd in HD 415, which is at low numbers, continues to increase slowly. This hunting district is mostly inaccessible by vehicle and escape cover is plentiful (except along the perimeters of the Blackfoot Indian Reservation and Glacier National Park). Year-round illegal hunting has been suspected as the factor suppressing population growth for several decades. Stepped up enforcement efforts in addition to improved vehicle management on the Lewis and Clark National Forest portion of the hunting district during the past five years have improved the outlook for this herd.

The elk population will be increased under a hunting season with the first one to two weeks either-sex hunting and the

balance of the season any-bull. More liberal antlerless seasons will be initiated when a wintering population of 500 is reached.

Increased monitoring of elk populations will have to be implemented if oil and gas exploration activities are increased in the Badger-Two Medicine area. Radio-marked animals should be used to assess and monitor displacement effects of exploration activities. Elk wintering in HD 441 are slowly increasing in numbers and will be allowed to approach 500 before a liberal harvest strategy is considered.

The population will be regulated with a five week any-bull hunting season. Elk hunting east of the Bob Marshall Wilderness boundary would be by permit only. Any-bull hunting will be conducted west of the wilderness boundary. This strategy allows a zone of safety for bulls once they reach winter range. The antlerless harvest would be controlled by special permit. The bull harvest in HD 151 greatly effects survival of bulls wintering in HD 441. Continued monitoring may point towards changes in HD 151 regulations if appreciable increases in HD 441 are to be realized.

Monitoring

Forage quantity on MDFWP wildlife management areas will be monitored by replicated permanent transects and plots, and frequent field inspections. Federal agencies will similarly monitor winter ranges under their management.

Geographical Information Systems will be utilized to measure gross habitat conditions such as cover:forage ratios as they become available.

Antler beam and body measurements from harvested elk will be collected at check stations and in the field, and will be used to monitor overall condition of the year-long habitat.

Radio-collared elk will be used as a tool to solve specific habitat management questions or needs as they arise.

The number of trail-heads and new trail development will be monitored. The Forest Service will inventory their road management systems and determine open road densities.

The status of habitat on private lands will be pursued through continued contacts with landowners.

All hunting districts within the Bob Marshall Unit share elk with backcountry districts, and most share some elk with several adjacent districts. Elk that winter, and are subsequently

counted, in one hunting district may be killed in another district. To a great extent, the populations dynamics on winter and spring ranges are a reflection of elk harvests in distant hunting districts. This is especially true when looking at the relationship of the back-country districts to those on the periphery of the complex. Strategies to monitor the indicators and standards should therefore take the approach of examining hunting districts as single pieces (or strata) of a very large and diverse total picture.

Trends in elk numbers and condition as well as hunter harvest information will be combined to monitor the management actions. Estimates for the total Bob Marshall Unit will be derived using each hunting district or surveyed herd unit as a different strata.

Estimates of elk numbers will be derived from annual, late winter/early spring helicopter surveys, on 12 winter herd units. Surveys in the Swan Valley are the only new areas that will be needed above current efforts. The "Idaho Sightability Model" will be used on selected areas to more accurately determine population numbers by sex and age-class. Late-winter flights will be used to sample bull:cow and calf:cow ratios. Summer surveys will be flown in the Sun River area and Scapegoat Wilderness to monitor pre-hunting season population size and calf production. Other areas will be identified and similar surveys developed for those areas as well.

Radio telemetry studies will be used to better define and monitor herd units and their movements. A sample of radioed elk will be maintained in areas of intensive population surveys.

Harvest trends, elk population age structure, animal condition, and antler characteristics will be monitored through five check stations. Permanent check stations will be maintained at Augusta (HDs 424, 425, 427 and 428), Bonner (HDs 130, 280, 281, 285 and 282), Hungry Horse and Martin City (HDs 140 and 150), and Swan Lake (HDs 130, 281, 282 and 285). A voluntary tooth turn-in in the backcountry hunting districts (HDs 150, 151 and 280) will be continued. If sample sizes fall below what is needed, a mandatory check may be instituted. Year-long habitat, and subsequently animal condition, will also be monitored by antler and diastema measurements taken at check stations.

State-wide hunter harvest surveys will be used to monitor total harvests, hunter effort, timing of harvest, and antler-point distributions in hunting districts not covered by check stations. Outfitter reports will be monitored to track outfitter use and harvests in backcountry areas. Statewide harvest data will be calibrated against check station data to monitor its applicability.

Hunter contacts, as well as camp and trail-head checks, will be used to also monitor hunter distribution and numbers.

Cumulative five-year averages will be used to determine the success and failure of management actions. In the case of a generally increasing trend in standards, the existing management actions simply may need more time to achieve the objective.

In case of a failure to demonstrate an increased bull:cow ratio, contingency options include one or more of the following:

1) More aggressive road management and cooperative timber management programs designed at achieving the standards.

2) A five-week general big game season with opening and closing dates moved two weeks earlier. This would be expected to increase bull survival over a several year period by limiting hunting when elk are concentrated on winter range. This is contingent upon acceptance of the early opening and closing dates for surrounding areas to distribute a transfer in hunting pressure.

3) Begin the early rifle season on October 1. This would provide an early hunt outside of the peak of vulnerability during the rut. If this later starting date was enacted, the season's closing date could probably coincide with the general big game season.

4) The antlerless harvest could be regulated with special permits or A-7 licenses, instead of either-sex hunting, to encourage population growth.

5) Shorten the current general elk season to three weeks. This would limit hunting while elk concentrate on winter ranges.

6) Antler point restrictions such as four point or better seasons or allowing only bulls to be taken with branching below the mid-point on the beam. Illegal kills and increased harvest pressure on older bulls are reasons why this is not the preferred alternative. Results of this season type are expected to produce more two-year-old elk, but fewer bulls 4.5 years (six point) or older.

FISHERIES INDICATORS, STANDARDS, AND POTENTIAL MANAGEMENT ACTIONS

The fisheries resource within the BMWC is extensive and unique. More than 500 miles of streams and 35 lakes support populations of native and introduced species of salmonids. Waters within the BMWC represent a genetic stronghold for two native fish species of special concern -- bull trout and westslope cutthroat -- and provide thousands of angler days of recreation.

Statewide creel surveys have estimated that the South Fork Flathead River alone supports from 5,000 to 12,000 angler days each year.

This section of the report describes current fisheries management, biological indicators and standards, and further management actions that may be required to maintain those standards. These actions are consistent with the strategies discussed in the previous section.

SOUTH FORK OF THE FLATHEAD RIVER

General Discussion

The South Fork of the Flathead River and Hungry Horse Reservoir support a high quality fishery for native species. Westslope cutthroat trout and bull trout support the majority of the sport fishery. Fisheries management direction in the drainage has emphasized a quality fishery with restrictive limits, rather than a high-harvest production fishery for those two Species of Special Concern. Large numbers of mountain whitefish inhabit the river and reservoir, but few anglers take advantage of this sport potential and food source.

Since more restrictive regulations were initiated in 1983, the average size of cutthroat in the population has increased in the South Fork Flathead River within the wilderness complex. Catch rates have increased, and density estimates appear to be good for an area noted for its clear, pristine, relatively nutrient-poor water. The current angling limits are three fish

per day, none over 12 inches. This regulation allows cutthroat to reach maturity yet still provides anglers with fish to eat, an important part of the wilderness experience.

MDFWP and a group of concerned citizens have prepared a fisheries management plan for the entire South Fork drainage. The fishery should be managed consistent with this plan, forest plan guidelines, and wilderness principles. Is it?

Indicators and Standards

A monitoring program should be continued to track the response of the fishery to fishing pressure and regulations. Three sections of the South Fork should be included in the monitoring program: the Gordon section in the upper area, the Black Bear section in the lower middle area of the wilderness, and the Harrison section in the South Fork below the wilderness boundary. These three sections have been previously surveyed using the snorkel-Peterson method and would provide a good database for comparative purposes through the years. Also, these sections are representative of the three major fish habitat types found in the South Fork. An annual monitoring program on three sections of the South Fork would be ideal but cost-prohibitive due to the large amount of money and effort needed to survey the South Fork, especially in the wilderness complex. A more realistic option would be to survey a representative reach in the middle section of the South Fork every other year (Black Bear Section), with a survey of all three sections every fifth year. This strategy would reduce costs considerably, yet still enable biologists to detect major differences in cutthroat population numbers, size of fish, and age/growth. Biologists should use the snorkel-Peterson method to estimate cutthroat trout densities.

Is this being done? Can we do it? What will it take?

The headwaters area (including lower Danaher and Youngs Creek and the first 1.5 miles of the South Fork) should be sampled annually as a baseline indicator site. The site has been sampled six consecutive years using the same methods. These data can be used to monitor yearly fluctuations in cutthroat catch rates and size distribution, information important in evaluating effects of angling regulations on the population.

We recommend the following standards for monitoring the health of the South Fork Flathead fishery. If monitoring data shows a 10 percent or more decrease from these standards, acceptable limits of impact are exceeded, and further management actions are required.

Is natural variation greater than 10%?
If so, how can this be affected?

Fish Length and Catch Rate:

(a) Using hook and line capture and a sample size of 300 or more cutthroat, the following standards should be met in the Black Bear section (monitored every other year):

- average length: ≥ 9.0 inches
- percent ≥ 10 inches: 25 percent
- percent ≥ 12 inches: 10 percent

(b) Using hook and line capture and a sample size of 100 or more cutthroat, the following standards should be met in the Headwaters section:

- average length: ≥ 10.0 inches
- percent ≥ 10 inches: 40 percent
- percent ≥ 12 inches: 15 percent

These fish should be caught at a rate exceeding 6.0 fish per hour under good angling conditions.

If annual monitoring data shows a 10 percent or more decrease from these standards, acceptable limits of impact are exceeded, and further management actions are required.

Fish Population Numbers:

Using the snorkel-Peterson method, the following standards should be met in the Black Bear section in alternate years:

- Total cutthroat population: 450 fish per km
- Number > 10 inches: 90 per km
- Number ≥ 12 inches: 40 per km

Creel Card Angler Survey:

Results from periodic angler survey (every second or third year) should indicate greater than 25 percent of cutthroat caught exceed 12 inches (estimated lengths of fish by anglers always exceed MDFWP estimates). Also, catch rates for cutthroat should exceed 2.5 fish per hour.

Age and Growth:

Calculated growth of westslope cutthroat captured in the Black Bear and Headwaters sections should exceed 245 mm (9.6 in) at age IV. Sample size should exceed 50 fish.

Potential Management Actions

If decreases below these standards are noted, agencies should implement further management actions. Potential management actions for the South Fork fishery include:

1. Restrict the use of bait on the South Fork Flathead River.

2. Require barbless hooks, artificial lures only.

3. Reduce the angling bag limit to one or two fish.

4. Implement an educational program on regulations and catch and release techniques.

5. Increase enforcement of regulations through cooperative agency efforts.

6. Regulate the number of float-anglers or total anglers on the river.

7. Impose a catch and release angling regulation on all or a portion of the South Fork within the BMWC.

MIDDLE FORK OF THE FLATHEAD RIVER

General Discussion

The major sport fish (numerically) in the Middle Fork Flathead River and its tributaries within the BMWC is the westslope cutthroat. Westslope cutthroat are a species of special concern, and have been shown to be highly susceptible to angler harvest. Therefore, we recommend maintaining the current stream fishery limits of three fish, none over 12 inches (305 mm) in the Middle Fork drainage within the BMWC.

Cutthroat trout inhabit all of the 12 mountain lakes in the Middle Fork drainage within the BMWC. Six of these lakes are planted with cutthroat regularly; in six of the lakes, populations are maintained through natural reproduction. The present lake fishing limit of three fish, no size restrictions, appears to allow for a reasonable harvest while maintaining an adequate population size. Almeda and Dickey lakes harbor pure westslope cutthroat from the new brood stock. These lakes are difficult to access because of primitive trail conditions. To

protect these stocks and provide a varied angling experience, trail maintenance into this area should be halted.

Bull trout provide an important trophy fishery in the Middle Fork Flathead River and some of its tributaries (e.g., Schafer and Dolly Varden creeks). Anglers are willing to expend eight hours or more to catch a single mature bull trout. Based on our spawning site surveys, the number of bull trout spawning sites (redds) in the drainage has been relatively stable. Apparently, the current fishing limit of one fish daily and in possession is affording adequate protection for the spawning adults.

The Middle Fork drainage is unique within the BMWC in that the upper portions of certain tributary drainages are undergoing timber harvest near the BMWC boundary. Stream habitat degradation from this activity is extending down-stream within the BMWC. Man-caused habitat degradation is contrary to the concept of wilderness protection, and should be discontinued. Therefore, we recommend no further road construction, timber harvest, or other activities that cause pollution in tributaries that flow into the BMWC. To be consistent with the wilderness act, which the U.S. Forest Service administers, timber and road activities should be halted and no further work planned in the following drain-ages: Morrison, Granite (includes Challenge and Dodge) and Twenty-five Mile.

Trail construction improvements and location also could have a negative impact on the fishery in the Middle Fork drainage within the BMWC. Trail locations should be examined carefully along tributary reaches important for bull trout spawning (see maps in Appendix Report), where large, mature bull trout spawners are vulnerable and very sensitive to disturbance. Specifically, Trail Creek supports a large number of bull trout spawners, and the existing trail has a history of limited maintenance. To reduce access and disturbance to this concentrated spawning area, we recommend halting all trail maintenance in the drainage.

Increased access to westslope cutthroat rearing areas could encourage overharvest of fish in important nursery areas. Basin Creek (above its junction with Bowl Creek) is a critical rearing area for cutthroat and the trail along its length has a history of low maintenance. To reduce access to this cutthroat rearing area, we recommend discontinuing all trail maintenance in the Basin Creek drainage above Bowl Creek.

Indicators and Standards

We recommend the following standards for monitoring the health of the Middle Fork fishery. If monitoring data shows a 10 percent or more decrease from these standards, acceptable limits

of impact are exceeded and further management actions are required.

Cutthroat Population Numbers:

Using the snorkel-Peterson method, the following standards should be met in the Gooseberry section (Gooseberry Cabin to Clack Creek) in alternate years:

- Total cutthroat population: 250 fish

These numbers may have to be adjusted as more estimates are completed in normal water years.

Cutthroat Length and Catch Rate:

Using hook and line capture and a sample size of 75 or more cutthroat, the following standards should be met in the Gooseberry section:

- Average length: ≥ 8.0 inches
- Catch rate: ≥ 3 fish per hour under good conditions
- Percent ≥ 10 inches: 10 percent

Creel Card Angler Survey:

Results from periodic angler surveys (every second or third year) should indicate greater than 10 percent of cutthroat caught exceed 12 inches (estimated lengths of fish by anglers always exceed MDFWP estimates). Catch rates of cutthroat trout should exceed 0.8 fish per hour.

Bull Trout Spawning Sites:

Bull trout populations are very sensitive to disturbance both within and outside the BMWC boundary. Bull trout which spawn in the Middle Fork drainage within the BMWC migrate a minimum of 150 km. They are exposed to angling in Flathead Lake and in the Flathead River system along the length of their migration route. To monitor spawning success, bull trout redds should be counted each year in selected tributaries within the BMWC (Table 44). Trends in the number of redds in each tributary should be closely followed and compared to counts outside the BMWC in other portions of the Flathead Basin. Counts should be no less than 20 percent below the average figure for the drainage. What do past fluctuations look like?

some question whether this can continue?

MDFWP should continue to measure streambed conditions on Granite Creek just upstream of the wilderness boundary to monitor sediment pollution entering the BMWC from timber activities upstream. Sediment conditions in this reach (44 percent fine

sediments in the streambed in 1987) are among the highest measured in the entire Flathead drainage.

Do we want to electrofish all trout? ; WSCT

Electrofishing estimates of juvenile bull trout and cutthroat trout in Morrison and Challenge creeks outside the wilderness boundary should be continued as they reflect population levels of progeny of adult fish which migrated upstream from the BMWC to spawn.

Mountain Lakes:

To build a better data base for managing cutthroat in mountain lakes in the drainage, we recommend a survey of two lakes per year by gill net and/or hook and line for size, genetics, and age/growth determination. Initially, we recommend survey of Stanton Lake and Tranquil Lakes (2). Stanton is an easy-access lake (1.5 miles, trail) with relatively heavy fishing pressure and small cutthroat. The Tranquil Lakes are difficult to reach, support lighter fishing pressure, and contain larger cutthroat. Cutthroat populations are maintained naturally in both Stanton and the Tranquil Lakes, but genetic make up of the fish is unknown. If funds are available, it would be desirable to collect fish from the two lakes for genetic testing. The remaining nine lakes in the drainage with fish populations could be surveyed as funds allowed, preferably two lakes per year.

Table 44. Bull trout redd counts for selected areas of tributaries chosen for monitoring in the Middle Fork Flathead drainage.

	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	Mean
Granite[a]	25.[b]	75	32.[b]	86	67	38	99	52	49	50	63	58
Lodgepole	14	34	14.[b]	34	31	47	24	37	34	32	31	30
Schafer	15	10	12	17	18	--	--	30	30	14	15	18
Dolly V.	20	21	31	36	53	--	--	42	51	46	56	40
Ole[c]	--	19	19	51	35	26	30	36	45	59	21	34
Mean Total												205

[a] Portions of the section counted are outside the BMWC.
[b] Incomplete survey, counts probably low.
[c] Glacier National Park

Potential Management Actions

If decreases below these standards are noted, agencies should implement further management actions. Potential management actions for westslope cutthroat are included under the South Fork section. If declines are detected in the number of bull trout spawning in the drainage steps should be taken to increase protection of the spawning run. Options for increased protection include:

(1) Restrict angling on Dolly Varden and Schafer creeks. These streams are important for bull trout spawning and are easily reached across from Schafer Meadows Guard Station (which is accessible by air).

(2) Restrict angling on all major spawning streams within the BMWC (Dolly Varden, Schafer, Clack, Strawberry, Bowl and Trail). Granite, Morrison, Long and Charlie creeks are already closed to angling.

(3) Restrict the season length for bull trout fishing in the river and/or tributaries.

(4) Close the river and/or tributaries to all taking of bull trout.

Adequate enforcement of angling regulations is difficult in the Middle Fork drainage within the BMWC. However, there are several steps which could be taken to improve compliance. First, prominent signs summarizing current regulations should be maintained at all trailheads. Second, personnel of the MDFWP and USFS could increase the frequency of joint enforcement patrols. Finally, a system similar to TIPMONT could be encouraged within the BMWC to reduce the illegal harvest of bull trout from streams in which they spawn. "Snagging" of bull trout in shallow spawning streams was the illegal fishing activity most frequently heard by biologists working in the drainage within the BMWC.

Blackfoot River

The Blackfoot River drainage waters have received a significant number of cutthroat fish plants of unknown genetic make-up. We recommend that fish surveys in these drainages should include genetic evaluations to determine if the native westslope cutthroat trout stocks have been altered and how much.

The greatest need in the Blackfoot drainage is a biological database from which informed management decisions can be made. We recommend a three to five year baseline study with a full-time

funding? priorities?

three-person crew (a biologist and two technicians) and adequate equipment and travel. No monitoring standards can be proposed at this time because of insufficient information.

To begin building a fisheries database for management decisions, we suggest a cooperative effort between FWP Regions 1 and 2 to sample a 1.5-km section of the North Fork Blackfoot River within the BMWC. This sampling would include hook-and-line methods to tag fish and collect scales for age and growth, followed by a snorkel survey to estimate cutthroat population densities.

Other options include: (1) no further improvements on the Bighorn Lake trail, to protect the naturally reproducing cutthroat population there, (2) no trail construction to access Little Crystal lakes, and (3) planting Little Crystal lakes with westslope cutthroat trout.

EAST FRONT DRAINAGES

General Discussion

Streams draining the East Front within the BMWC support an important fishery for rainbow, cutthroat and eastern brook trout. Lack of information on the fishery limits the effective management of this resource. We recommend a three year baseline study on fisheries and stream habitat on the East Front drainages within the BMWC to collect information necessary for building a database for sound management. The genetic purity of cutthroat populations within the drainages is unknown. We recommend genetic testing in North and South Fork Sun River Drainage tributaries where cutthroat populations exist, and in the Teton River, Birch Creek, Dupuyer Creek and Dearborn River drainages.

Indicators and Standards

Rainbow and cutthroat population numbers:

Using the snorkel-Peterson method, the following standards should be met in the South Fork of the Sun River from Windfall Creek to Bear Creek (1.06 miles).

- Total rainbow and cutthroat population: 900 fish

Rainbow and cutthroat lengths and catch rates:

Using hook and line capture, and a sample of 100 or more fish, the following standards should be met in the South Fork Sun River:

- Average length: ≥ 11 inches
- Percent ≥12": 30 percent

On the North Fork Sun River:

- Average length: ≥ 10 inches
- Percent ≥12": 20 percent

Creel Card Angler Survey:

Results from periodic angler survey (every second or third year) should indicate greater than 20 percent of trout caught exceed 12"; rainbow trout should be caught at rates exceeding 2.0 fish per hour.

Potential Management Actions

If decreases of 10 percent or more below these standards are noted, potential management actions listed under the South Fork section could be implemented. However, agencies could consider actually increasing limits on rainbow trout in the drainage to encourage recreation on this non-native species.

Overall Fishery Management Recommendations

Presently, fisheries management within the BMWC is based on general guidelines agreed upon in 1979 by the MDFWP director and the regional forester for Region 1, USFS. Fisheries managers in MDFWP Regions 1, 2 and 4 cooperate with district rangers to formulate local management actions. MDFWP and USFS will reexamine the memorandum of understanding between the two agencies, and update the document in light of new information and the results of this L.A.C. process. Strategies should be clarified and reaffirmed for the following:

This may be nearing completion already

1. Techniques of fish population sampling (rotenone, motorized electrofishing).

2. Chemical rehabilitation of lakes.

3. Fish planting (native vs. non-native species, endangered or threatened species, barren lakes, aerial planting).

4. Cooperative fish population monitoring.

5. Angling/recreation philosophy (harvest vs. population maintenance, angling and floating restrictions, angler access).

6. Habitat protection (trail construction within the BMWC, land use outside the BMWC that affects waters within the BMWC).

7. Management of fish species such as cutthroat and bull trout which migrate into and out of the BMWC.

8. Enforcement of angling regulations.

9. Consideration of a cooperative fisheries biologist position for the BMWC.

The valuable fisheries resource within the BMWC will be benefitted by comprehensive, consistent fisheries management that recognizes the balance between maintaining the integrity of fish populations and providing angling recreation. Management should be consistent with existing fisheries management plans (i.e., South Fork Flathead). We recommend formation of a fisheries management committee for the BMWC which would consist of the MDFWP fisheries managers, representatives of the four national forests within the BMWC, and designated public participants. This committee could formulate a detailed management plan, and recommend adaptive fisheries management policies for review by the MDFWP Director and regional forester.

CONCLUDING COMMENTS

This plan for the fish and wildlife of the BMWC ecosystem is offered to the Montana Department of Fish, Wildlife and Parks (MDFWP) and the United States Forest Service (USFS) for implementation. The plan is, to a substantial extent, the perspective of its authors. The plan put forward has been molded by comment, suggestion and criticism offered by the many participants of the LAC Task Force and the Fish and Wildlife Committee of that group. These contributions have been very valuable, and as a result, this report is the product of the MDFWP, citizen volunteers, and USFS personnel.

In essence everyone working on this project was a volunteer, completing this job in addition to other full time assignments. The sole motivation was a common concern for the Wilderness resource and the fish and wildlife dependent upon it.

Implementation

This plan is now remanded to David Jolly, Regional Forester of the Northern Region, USFS, and K. L. Cool, Director of the MDFWP for consideration and implementation as part of the work of the Bob Marshall Wilderness LAC Task Force.

It is recommended that this plan be implemented through the execution of a Memorandum of Understanding (MOU) between the principle management agencies, the USFS and the MDFWP.

It is further recommended that the MOU provide for the creation of three interagency plan implementation entities. These entities would be a Wilderness Management Policy Committee, a Technical Committee, and a Bob Marshall Wilderness Management Coordinator in each agency.

It is finally recommended that the above-named groups, working within the framework of a MOU, continue to work within the framework of the LAC process to assure public access to the Wilderness management agencies.

James A. Posewitz

Gayle L. Joslin

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Shawn Riley

APPENDICES

Appendix 1. Descriptions of forest management area prescriptions according to the following categories: Wilderness, Proposed Wilderness, Unroaded, Low-Moderate Access, and Developed-Timber.

No.	Name	Forest[1]	Roads	Description
WILDERNESS PRESCRIPTIONS				
P	Classified Wilderness	L&CNF	Roadless	Bob Marshall and Scapegoat Wildernesses; grazing is allowed, withdrawn from mineral activity.
P-1	Wilderness	HNF	Roadless	Scapegoat Wilderness; 34% managed by Lincoln Ranger District; grazing is all owned, withdrawn from mineral activity.
12	Wilderness	LNF	Roadless	Bob Marshall and Scapegoat Wildernesses; grazing is allowed; withdrawn from mineral activity.
18	Wild & Scenic River	FNF	Roadless in Wild segment; in Recreational and Scenic Segment, designed to enhance river values.	Flathead River; pack stock grazing only; no timber harvest; mineral leasing withdrawal; in Wild Segment no motorboats, in Recreational and Scenic segment, no boats exceeding 10 horsepower will be allowed.
21	Wilderness	FNF	Roadless	Great Bear and Bob Marshall Wilderness areas; allowed; withdrawn from mineral activity.
PROPOSED WILDERNESS PRESCRIPTIONS				
Q	East Slope Recommended Wilderness	L&CNF	All areas and trails open to trail vehicles and snow machines, except where restricted.	Manage to protect wilderness values.
N	RARE II	L&CNF	Minimize access; limit motorized use to existing roads. No construction for surface resources; for subsurface resources roads will be closed to public.	Deep Creek Reservoir North; further planning area pending oil and gas decisions; grazing is allowed.
12	Proposed Wilderness	LNF	Roadless	Same prescription number as Wilderness; timber harvest not permitted; grazing is allowed.
-	Proposed Wilderness	FNF	No motorized access except for administrative purposes to microwave repeater.	Shaded area on management area map. Area 19 Jewel Hiking Area; no surface occupancy for minerals; helicopter access allowed.

Appendix 1. (cont'd.)

No.	Name	Forest[1]	Roads	Description
UNROADED PRESCRIPTIONS				
N-1	Research Natural Areas	HNF	No Construction.	Timber harvest and livestock grazing, will not be allowed; areas for research, observation and study.
8	Timberland/Roadless	FNF	Roads constructed for temporary support of aerial harvest or mineral access.	Timber harvest scheduled; pleasing natural appearance.
R-1	Primitive and Semi-Primitive Recreation	HNF	Roads will not be constructed except to access mineral activity on private land; roads exist but motorized access not allowed.	Unsuitable for timber management; grazing is allowed and range improvements may be implemented (salt; water developments).
LOW-MODERATE ACCESS PRESCRIPTIONS				
E	Big Game Winter Range/ Livestock	L&CNF	Local roads may remain open; low access (0.5-1.5 mi/mi^2) will be maintained. New roads will be allowed only for minerals. Some seasonal closures.	Harvest unprogrammed timber; maintain grazing.
F	Semi-primitive Recreation	L&CNF	Existing roads maintained.	Unprogrammed timber. Existing range use; maintain as is. Undeveloped land with limited motorized access. Semi-primitive recreation.
G		L&CNF	Motorized access limited to designated roads and trails; no new roads unless for minerals; these will be reclaimed.	Harvest unprogrammed timber using existing roads only; existing range use; existing condition.
O	Commercial Forest	L&CNF	Limit motorized access to existing roads and trails. New roads will be closed to the public.	Low intensity timber production at 0.5 million board-feet per year/moderate grazing.
I	Wildlife Habitat	L&CNF	0.5-1.5 mi road/mi^2. Roads built only for mineral activity.	Harvest unprogrammed timber; maintain existing range permits.
M-1		HNF	Roads allowed for minerals, special uses, and access to other management areas. Maintain existing roads.	Salvage and firewood timber harvest. Unsuitable for timber management. Maintain present condition with minimal investment.

Appendix 1. (cont'd.)

No.	Name	Forest[1]	Roads	Description
L-1	Grazing	HNF	Motorized recreation allowed.	Timber harvest may be used to improve forage production; unsuitable for timber production. Vacant allotments will be restocked if in demand.
L-2	Grazing/Wildlife	HNF	Motorized access limited to designated routes.	Livestock grazing maintained; timber harvest may my used to improve forage production; unsuitable for timber management.
W-1	Wildlife	HNF	Road management.	Variety of wildlife habitat; timber harvest only to enhance wildlife values.
1	Nonforest/Noncommercial	LNF	Roads exist; some travel restrictions; construction for access to adjacent areas may occur or for mineral activity.	Scattered parcels; unsuitable for timber harvest but salvage and firewood harvest may occur; grazing permitted; maintain wildlife habitat.
10		LNF	Unroaded; roads permitted for mineral activity if need is proven, public use may be restricted.	Small unroaded parcels; severe physical constraints; unsuitable for timber; maintain natural condition; livestock grazing permitted.
11	Dispersed Recreation	LNF	No motorized access except for mineral activity; some roads exist.	Dispersed recreation; unsuitable for timber harvest; grazing allowed.
13	Riparian/Water Quality	LNF	Roads exist; new road construction will be limited.	Timber harvest scheduled; occasional pack stock grazing; enhance fish and aquatic habitat, wildlife, water quality or recreational.
14	Riparian/Grazing	LNF	Numerous roads exist; new construction will be constrained.	Timber harvest scheduled on portion of area; grazing is allowed in some areas.
19	Wildlife	LNF	Roads will not be constructed for surface management activities but may pass through to access other management areas.	Unsuitable for timber harvest; grazing is allowed if compatible with wildlife.
20	Grizzly/Timber	LNF	Few roads will be left open to public use; new roads will be closed.	Timber harvest scheduled; livestock grazing allowed.
20a	Grizzly/Nontimber	LNF	Seasonal road closures; road construction to access other areas or for mineral activity.	Optimize grizzly habitat conditions; timber harvest only for habitat improvement and safety hazards; unsuitable for timber harvest.

Appendix 1. (cont'd.)

No.	Name	Forest[1]	Roads	Description
27	Commercial Forest	LNF	Roads may pass through to access other areas or for mineral development.	Difficult to harvest, therefore timber considered unsuitable; livestock grazing may occur but will be incidental; no management activities increase wildlife use.
1		FNF	Construction allowed to meet adjacent management area objectives.	Maintain present conditions; minimal investment.
2, 2A 2B	Primitive & Semi-primitive Rec.	FNF	Some motorized, some unroaded.	Six subprescriptions to provide variety of primitive and semi-primitive recreation; existing facilities will be maintained; timber salvage and firewood but timber harvest will not be scheduled; existing grazing maintained; no surface mineral occupancy.
3		FNF	Roads exist; mineral roads will be closed to public.	
11, 11A	Grizzly Habitat	FNF	Control public access; new roads will be local, low standard.	Six subprescriptions to maintain or improve grizzly habitat, maintain existing facilities, including certain campgrounds; grazing is not allowed; timber harvest varies from scheduled to unscheduled.
12	Riparian	FNF	Roads exist; new roads constructed with limitations.	Enhance riparian vegetation and wildlife diversity; unscheduled timber harvest may occur if compatible with riparian goals; grazing is allowed.
13, 13A, 13D	Timberland/Wildlife	FNF	Roads constructed if compatible with wildlife; seasonal closures.	Suitable (13) and unsuitable (13A, 13D) timber; and unscheduled harvest will occur; grazing allowed.
DEVELOPED-TIMBER PRESCRIPTIONS				
H	Developed Recreation/ Livestock	L&CNF	Achieve high public access. (+3.0 mi. of open road/mi^2).	Campgrounds, ski areas, recreation residences, some livestock grazing, harvest unprogrammed timber. Create new recreation sites or expand existing sites.
2	Administrative Sites	LNF	Roads will be constructed.	Ranger stations, work centers, lookouts; grazing is allowed; administrative timber removal.

Appendix 1. (cont'd.)

No.	Name	Forest[1]	Roads	Description
9	Recreation Areas	LNF	Extensive road system in place.	Concentrated public use; near population centers, streams or lakes; recreation is encouraged; unsuitable for timber harvest.
16	Timber	LNF	Extensive road system in place and will be further developed.	Timber harvest scheduled; grazing may be
17	Timber	LNF	Extensive road system in place; average density of 1.5 mi/mi^2.	Timber harvest scheduled; grazing may be allowed.
24	Visual/timber	LNF	Extensive road system; densities vary from 4.6 mi to 2.8 mi/mi^2.	Timber harvest scheduled.
25	Visual/Partial Retention	LNF	Extensive roads system.	Timber harvest scheduled.
5	Roaded Timberlands	FNF	Roads will be constructed.	Maintain natural landscape; scheduled timber harvest.
7	Roaded Timberlands	FNF	Roads will be constructed.	Two subprescriptions; timber harvest scheduled; maintain a pleasing natural landscape.
9, 9B	Timberlands/Deer Winter Habitat	FNF	Seasonal closures; road construction or reconstruction if compatible with white-tailed deer.	Timber harvest scheduled and grazing allowed on management area 9; timber harvest not scheduled and grazing not allowed on 9B.
11C	Timberlands/Grizzly Habitat	FNF	New roads will be local, low standard; seasonal closures.	Timber harvest scheduled; grazing allowed.
13	Timberland/Wildlife	FNF	Seasonal closures; road construction and reconstruction if compatible with deer and elk.	Five subprescriptions; 13 and 13C suitable for timber harvest and will be scheduled; grazing allowed in 4 areas and not allowed in 1.
15	Timberlands	FNF	Some motorized restrictions; roads will be constructed.	Six subprescription; emphasize timber; livestock grazing allowed.
16	Timberlands	FNF	Roads for timber may be constructed, otherwise support roads for aerial harvest will be temporary.	Four subprescriptions; emphasize timber except on 678 acres of proposed wilderness; no permitted livestock grazing.

Appendix 1. (cont'd.)

No.	Name	Forest[1]	Roads	Description
17	Riparian/Timber	FNF	Roads will be constructed.	Timber harvest scheduled; grazing allowed.
T-1	Timber	HNF	Constructed as needed.	Timber production; grazing maintained.
T-2	Timber/Wildlife	HNF	Road management constructed as needed.	Timber production, grazing maintained.
T-3	Timber/Wildlife	HNF	Constructed as needed.	Timber production compatible with wildlife; grazing maintained.
T-4	Timber/Visual	HNF	Road management, constructed as needed.	Timber production; grazing maintained.

[1/]Forest abbreviations:
L&CNF = Lewis and Clark National Forest
HNF = Helena National Forest
LNF = Lolo National Forest
FNF = Flathead National Forest

SUMMARY OF APPENDIX 1

Combinations of U.S. Forest Service management area prescriptions used in the 1986 Forest Plans to quantify land use activity on four forests within the BMWC ecosystem.

	National Forests			
	Flathead	Lolo	Helena	Lewis & Clark
Wilderness (W)	18[1/] 21	12	P-1	P
Proposed Wilderness (P) or RARE II areas	19	12		Q N
Unroaded (U)	8		R-1 N-1	
Low - Moderate Access (L)	1 2 12 2A 13A 2B 13D 3 10 11 11A	1 27 10 11 13 14 19 20 20a	M-1 L-1 L-2 W-1	E F G O I
Developed - Timber (T)	5 17 7 9 11C 13 15 15E 16	2 9 16 17 24 25	T-1 T-2 T-3 T-4	H

[1/] All management prescriptions are from 1986 Forest Plans.

Appendix 2. Land ownership and USFS land management on elk winter ranges within the BMWC ecosystem.

LEWIS & CLARK		TOTAL	LAND OWNERSHIP						FS MANAGEMENT				
			FS	PRVT	CORP	STATE	BLM	BLKFT	WLDRNS	P.WLDR	U	M	TD
ID.	NAME												
1	Badger Two-Medicine	21,952	17,984	1,664	-	-	-	2,304	-	-		17,984	-
2	Badger	8,448	8,256	-	-	-	-	192	-	-	2,890	5,366	-
3	Lookout R	3,328	2,880	-	-	-	-	448	-	-	1,296	1,584	-
4	Blackleaf-Scoffin	73,536	13,952	44,352	-	10,688	4,544	-	2,432	-	-	11,520	-
5	Teton-Twin Lakes	2,368	-	1,856	-	512	-	-	-	-	-	-	-
6	NF Sun	22,592	19,904	1,856	-	64	768	-	8,256	6,784	2,560	1,152	1,152
7	Deadman	192	192	-	-	-	-	-	192	-	-	-	-
8	Pretty Prairie	3,328	3,328	-	-	-	-	-	3,328	-	-	-	-
9	Sun RGR-Ford Cr	54,144	16,832	16,832	-	19,136	1,344	-	-	-	-	16,128	704
10	Haystack	4,608	-	3,520	-	1,088	-	-	-	-	-	-	-
11	Harrison Ridge	5,824	-	5,120	-	448	256	-	-	-	-	-	-
12	Cuniff Basin	1,344	576	448	-	320	-	-	-	-	-	576	-
13	Wrangle Cr.	2,240	-	2,240	-	-	-	-	-	-	-	-	-
14	Falls Cr. Ridge	1,856	1,344	512	-	-	-	-	-	-	-	1,344	-
TOTAL		205,760	85,248	78,400	-	32,256	6,912	2,944	14,208	6,784	6,746	55,654	1,856

Appendix 2. (continued)

HELENA		TOTAL	LAND OWNERSHIP						FS MANAGEMENT				
			FS	PRVT	CORP	STATE	BLM	BLKFT	WLDRNS	P.WLDR	U	M	TD
ID.	NAME												
15	Sunrise-Sunset	13,632	3,200	9,280	-	640	512	-	-	-	-	3,200	-
16	Alice Cr	256	256	-	-	-	-	-	-	-	-	256	-
17	Cool Cr	960	-	192	256	512	-	-	-	-	-	-	-
18	Theodore	2,624	320	576	768	960	-	-	-	-	-	-	320
19	Marcum-Long	1,612	102	422	486	-	602	-	-	-	-	-	102
TOTAL		19,084	3,878	10,470	1,510	2,112	1,114	-	-	-	-	3,456	422
LOLO													
19	Marcum-Long	6,452	410	1,690	1,946	-	2,406	-	-	-	-	-	410
20	Ovando Mtn.	9,152	128	1,152	4,288	3,584	-	-	-	-	-	-	128
21	Blackfoot-Clearwater	22,016	-	3,904	10,816	7,296	-	-	-	-	-	-	-
22	Danahur-Dry FK	1,702	1,702	-	-	-	-	-	1,702	-	-	-	-
TOTAL		39,322	2,240	6,746	17,050	10,880	2,406	-	1,702	-	-	-	538

Appendix 2. (continued)

FLATHEAD		TOTAL	LAND OWNERSHIP						FS MANAGEMENT				
			FS	PRVT	CORP	STATE	BLM (GNP)	BLKFT	WLDRNS	P.WLDR	U	M	TD
ID.	NAME												
22	Danahur Mtn - Dry Fork	6,810	6,810	-	-	-	-	-	6,810	-	-	-	-
23	Hahn Cr	5,184	5,184	-	-	-	-	-	5,184	-	-	-	-
24	Danahur Basin	2,944	2,944	-	-	-	-	-	2,944	-	-	-	-
25	Black Bear Gordon Cr	34,880	34,880	-	-	-	-	-	34,880	-	-	-	-
26	Picture Rdg	4,160	4,160	-	-	-	-	-	4,160	-	-	-	-
27	Bunker Cr	5,632	5,632	-	-	-	-	-	-	-	-	4,672	960
28	Soup Cr - Condon	33,408	10,816	1,600	13,696	7,296	-	-	-	640	-	832	9,344
29	Swan-Lost Cr	3,456	3,072	-	-	384	-	-	-	-	-	640	2,432
30	Swan Lk-Sixmile	3,200	704	1,216	896	384	-	-	-	-	-	-	704
31	Sullivan Cr	2,624	2,624	-	-	-	-	-	-	-	-	640	1,984
32	Dry Park Big Bill Meadow Cr	42,240	42,240	-	-	-	-	-	2,560	-	-	11,840	27,840
33	Cable Mtn	1,280	1,280	-	-	-	-	-	1,280	-	-	-	-
34	Winter	6,144	6,144	-	-	-	-	-	6,144	-	-	-	-
35	Schaffer Md	1,088	1,088	-	-	-	-	-	1,088	-	-	-	-

Appendix 2. (continued)

FLATHEAD		TOTAL	LAND OWNERSHIP						FS MANAGEMENT				
			FS	PRVT	CORP	STATE	(GNP)	BLKFT	WLDRNS	P.WLDR	U	M	TD
ID.	NAME												
36	Patrol Rdg	2,688	2,688	-	-	-	-	-	2,688	-	-	-	-
37	Bradley Mtn	4,032	4,032	-	-	-	-	-	4,032	-	-	-	-
38	Spruce Cr	1,216	1,216	-	-	-	-	-	1,216	-	-	-	-
39	GNP Bear Cr	4,288	-	-	-	-	(4,288)	-	-	-	-	-	-
40	GNP Nyak	8,000	448	256	-	-	(7,296)	-	-	-	448	-	-
41	Firefighter	10,688	10,688	-	-	-	-	-	320	-	-	896	9,472
TOTAL		183,962	146,650	3,072	14,592	8,064	(11,584)	-	73,806	640	448	19,520	52,736

Appendix 3. Elk hunting regulations for hunting districts within the BMWC ecosystem, 1964 - 1986.

	1964	1969	1974	1979	1984	1986
130	HD13 Arch5[1] ES5 10[2]	HD13 ES3 AB 5	ES3 AB 5	ES1 AB 5	ES1 AB 5	ES1 AB 5
140	HD14 ES5 5	HD14 ES3 5 AB	ES3 AB 5	ES1 AB 5 AP1	ESP1 AB 5 ES1	ES1 AP1 5 AB
141	See 140 (14)	See 140 (14)	See 140	ES1 AB 5	ES1 AB 5	ES1 AB 5
150	HD15 ES6 6	HD15 ES8 10 AB	ES8 AB 10	ES4 AB 10	ES2 AB 10	ES2 AB 10
151	See 150 (15)	See 150 (15)	See 150	See 150	ES2 AB 10	ES2 AB 10
280	ES10 10	ES8 AB 11	ES8 AB 10	ES½ AB 10	AB AP5 10	BAB AP5 10
281	ES5 5	ES3 AB 6	ES2 AB 5	AB ES3 5	AB AP5 5	BAB AP5 5
282	See 285 (28)	ES2 2	ESP1½ 1½	ESP1 1	ESP2	ESP2
284	See 281	See 281	See 281	ES½ AB 5	ArchAB 5	ArchAB 5
285	HD28 ES5 5	HD28 ES3 AB 6	HD283 ES1½ AB 5	HD283 ES½ AB 5	HD283 AP5 5	AP5 AB 5
415	HD41-01-02 ES1 AB 5	ES2 AB 6	ES2 AB 5	ES1 AB 5	ES2 AB 5	ES1 AB 5
422	ES2 AB 5	ES5 5	ES5 5	ES5 5	ES5 5	ES5 5
424	See 422	HD422 ES6 6	ESQ AB 5	ESQ AB 5	ESQ AB 5	ESQ BAB 5

Appendix 3. Continued

425	HD42-01-02 -03 ESQ AB 5	ESQ AB 1	ES1 1	ESQ AB 5	ES2 2	AP2 Ant1 2
427	See 442 (42)	See 442 (42)	See 442 (42)	ESQ 5	ESQ AB 5	ESQ 5
428	See 425 (42)	See 442 (42)	See 424 (42)	ESQ 5	ESQ AB 5	ESQ 5
441	See 415 (41)	HD41 ES1 AB 6	ES1 AB 5	ES1 AB 4	ES2 AB 5	AP5 AB 5
442	See 425 (42)	HD42 ESQ AB 6	ESQ AB 5	ESQ AB 5	ESQ AB 5	ESQ BAB 5

HD = hunting district (recent HD number may be different from earlier number, due to division of early HD)
Arch = archery only
Q = quota
ES = either sex
ESP = either sex permit
AP = antlerless permit
ANT = antlerless elk
AB = antlered bull
BAB = branched antlered bull

[1]Arch5 = number next to hunting season code indicates season length for that code in weeks
[2]10 = total season length in weeks

Appendix 4. Elk harvest and composition, and numbers of hunters in the total BMWC elk ecosystem.

Total BMWC

YEAR	TOTAL	BAB[2]	SPIKE	COW	CALF	UNK	HUNTERS
1966	2358	824	416	896	211	11	9705
1967	2362	791	390	852	329	0	12,759
1968	2302	739	272	938	321	32	13,869
1969	1918	581	254	797	278	8	11,342
1970	2545	972	372	637	258	6	11,848
1971	2022	810	348	592	231	41	15,718
1972	2012	696	298	703	260	55	18,484
1973	2618	824	403	933	314	144	20,123
1974	1630	598	232	394	185	221	20,349
1975	2205	697	365	769	236	138	20,612
1976	1270	542	145	434	84	65	17,157
1977	1741	732	312	455	169	73	17,497
1978	1413	553	259	404	149	48	17,613
1979	1027	430	149	332	87	29	15,060
1980	1512	545	362	462	116	27	15,308
1981	1358	477	339	445	92	5	12,841
1982	1459	634	351	392	67	15	11,479
1983	1178	477	337	295	68	1	11,281
1984	2208	727	568	714	195	4	11,959
1985	1788	634	389	594	170	1	11,933

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[1] Hunting districts: 130, 140, 141, 150, 151 (Hunter questionnaire data)

[2] BAB: Branch-antlered Bull

Appendix 5. Elk harvest and composition, and numbers of hunters in Region 1 of the BMWC elk ecosystem. (Hunter questionnaire data.)

Region 1 of BMWC (Flathead)[1]

YEAR	TOTAL	BAB[2]	SPIKE	COW	CALF	UNK	HUNTERS
1964	1039	375	150	398	112	4	5422
1965	789	240	72	317	148	12	3878
1966	1529	516	273	570	159	11	5162
1967	1125	385	209	373	158	0	5708
1968	1284	374	146	625	132	7	6980
1969	892	217	190	390	87	8	5441
1970	938	528	141	181	82	6	5301
1971	1148	512	199	282	131	24	7566
1972	875	386	126	240	101	22	7404
1973	1359	471	241	470	122	55	9616
1974	949	390	170	193	97	99	10074
1975	1193	399	190	398	114	92	10320
1976	872	397	79	299	56	41	9088
1977	1082	534	162	263	98	25	9206
1978	777	308	115	235	88	31	9228
1979	680	291	105	207	59	18	8490
1980	794	307	136	271	63	17	8530
1981	716	294	194	181	47	-	6481
1982	759	379	149	186	37	8	6531
1983	698	302	206	157	33	-	6140
1984	950	388	281	199	82	-	5017
1985	673	357	124	144	48	-	5187

[1] Hunting districts: 130, 140, 141, 150, 151 (Hunter questionnaire data)

[2] BAB: Branch-antlered Bull

Appendix 6. Elk harvest and composition, and numbers of hunters in Region 2 of the BMWC elk ecosystem.

Region 2 of BMWC (Blackfoot-Clearwater)[1]

YEAR	TOTAL	BAB	SPIKE	COW	CALF	UNK	HUNTERS
1966	217	103	11	84	19	0	1289
1967	336	89	62	144	41	0	1647
1968	342	127	44	126	34	11	2414
1969	367	190	0	137	40	0	1927
1970	275	157	53	45	19	0	1677
1971	203	99	51	46	4	3	2529
1972	247	106	44	66	27	4	2703
1973	289	119	35	94	25	16	2372
1974	288	104	20	99	35	30	3973
1975	521	148	83	201	64	25	4433
1976	222	97	43	66	13	3	2876
1977	257	102	63	56	26	10	3334
1978	274	129	57	65	14	9	3393
1979	127	54	19	33	12	5	2234
1980	209	79	81	40	9	-	2133
1981	219	93	64	47	15	-	2176
1982	236	91	95	44	6	-	1968
1983	170	63	45	38	24	-	1804
1984	303	99	90	97	17	-	1950
1985	263	80	96	68	19	-	1880

[1] Hunting districts: 280, 281, 282 (Hunter questionnaire data).

Appendix 7. Elk harvest and composition, and numbers of hunters in Region 4 of the BMWC elk ecosystem.

Region 4 of the BMWC (Two Medicine, Birch, Teton, Sun, Dearborn)[1]

YEAR	TOTAL	BAB	SPIKE	COW	CALF	UNK	HUNTERS
1964	272	90	44	103	30	4	2716
1965	524	258	96	127	35	9	2763
1966	612	205	132	242	33	0	3254
1967	901	317	119	335	130	0	5404
1968	676	238	82	187	155	14	4475
1969	810	174	64	270	151	0	3974
1970	1033	287	178	411	157	0	4870
1971	671	199	98	264	96	14	5623
1972	890	204	128	397	132	29	8377
1973	974	234	127	369	167	73	8135
1974	393	104	42	102	53	92	6302
1975	491	150	92	170	58	21	5859
1976	176	48	23	69	15	21	5193
1977	402	96	87	136	45	38	4957
1978	361	116	87	104	47	8	4992
1979	224	85	25	92	16	6	4336
1980	509	159	145	151	44	10	4645
1981	423	90	81	217	30	5	4184
1982	464	164	107	162	24	7	2962
1983	310	112	86	100	11	1	3337
1984	955	240	197	418	96	4	4992
1985	852	197	169	382	103	1	4866

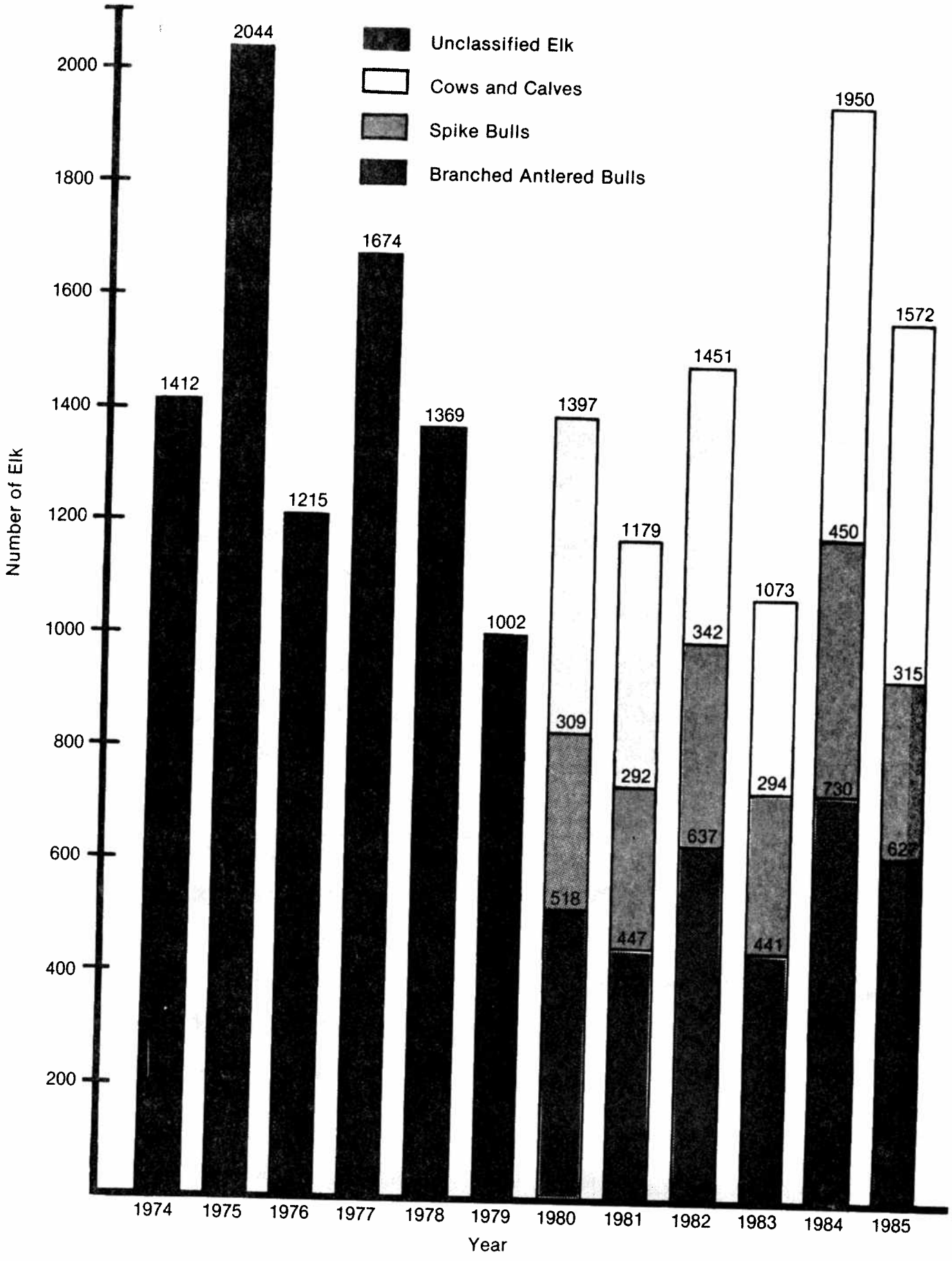
[1] Hunting districts: 415, 422, 424, 425, 427, 428, 441, 442 (Hunter questionnaire data).

Appendix 8. Elk harvest and composition, and numbers of hunters in Hunting District 28 (became 283 in 1973) involving the Clearwater, lower Blackfoot and portions of the Clark Fork river drainages.

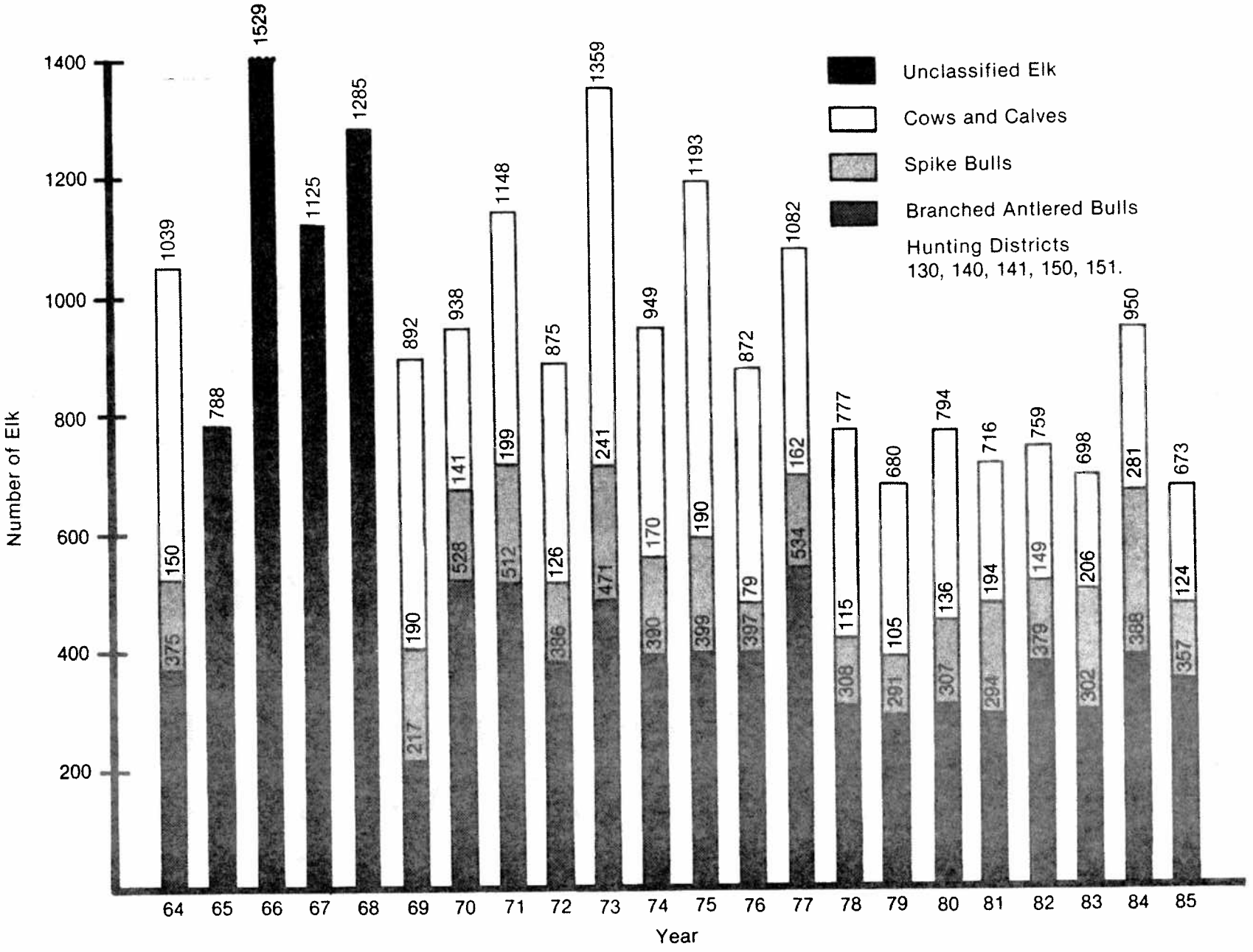
YEAR	TOTAL	BULL	SPIKE	COW	CALF	UNC	HUNTERS	HD #
1964	441	113	67	172	83	6	220	28[1](282, 283, 285)[2]
1965	360	100	50	156	53	0	1669	28 (282, 283, 285)
1966	363	152	34	113	65	0	1858	28 (283, 285)
1967	388	165	20	94	94	14	1686	28 (283, 285)
1968	514	183	59	206	66	0	2095	28 (283, 285)
1969	159	32	15	88	16	8	1551	28 (283, 285)
1970	307	93	74	111	28	0	2015	28 (283, 285)
1971	172	65	46	38	20	3	2323	28 (283, 285)
1972	210	99	22	70	21	0	2286	28 (283, 285)
1973	381	133	63	108	70	7	2917	283 (283, 285)
1974	240	78	38	80	7	37	3286	283 (283, 285)
1975	382	72	48	187	66	9	2647	283 (283, 285)
1976	151	47	38	48	13	5	2074	283 (283, 285)
1977	235	71	49	94	13	8	2563	283 (283, 285)
1978	187	37	52	82	18	0	2647	283 (283, 285)
1979	260	85	60	68	42	5	3057	283 (283, 285)
1980	275	86	132	43	11	3	2950	283 (283, 285)
1981	243	50	132	50	6	5	3043	283 (283, 285)
1982	237	70	100	53	13	1	3630	283 (283, 285)
1983	349	114	158	62	15	0	3485	283 (283, 285)
1984	182	54	95	30	3	0	2409	283
1985	156	45	71	37	2	1	2112	283

[1] About 1/3 of HD 28 occurs in the BMWC elk ecosystem.

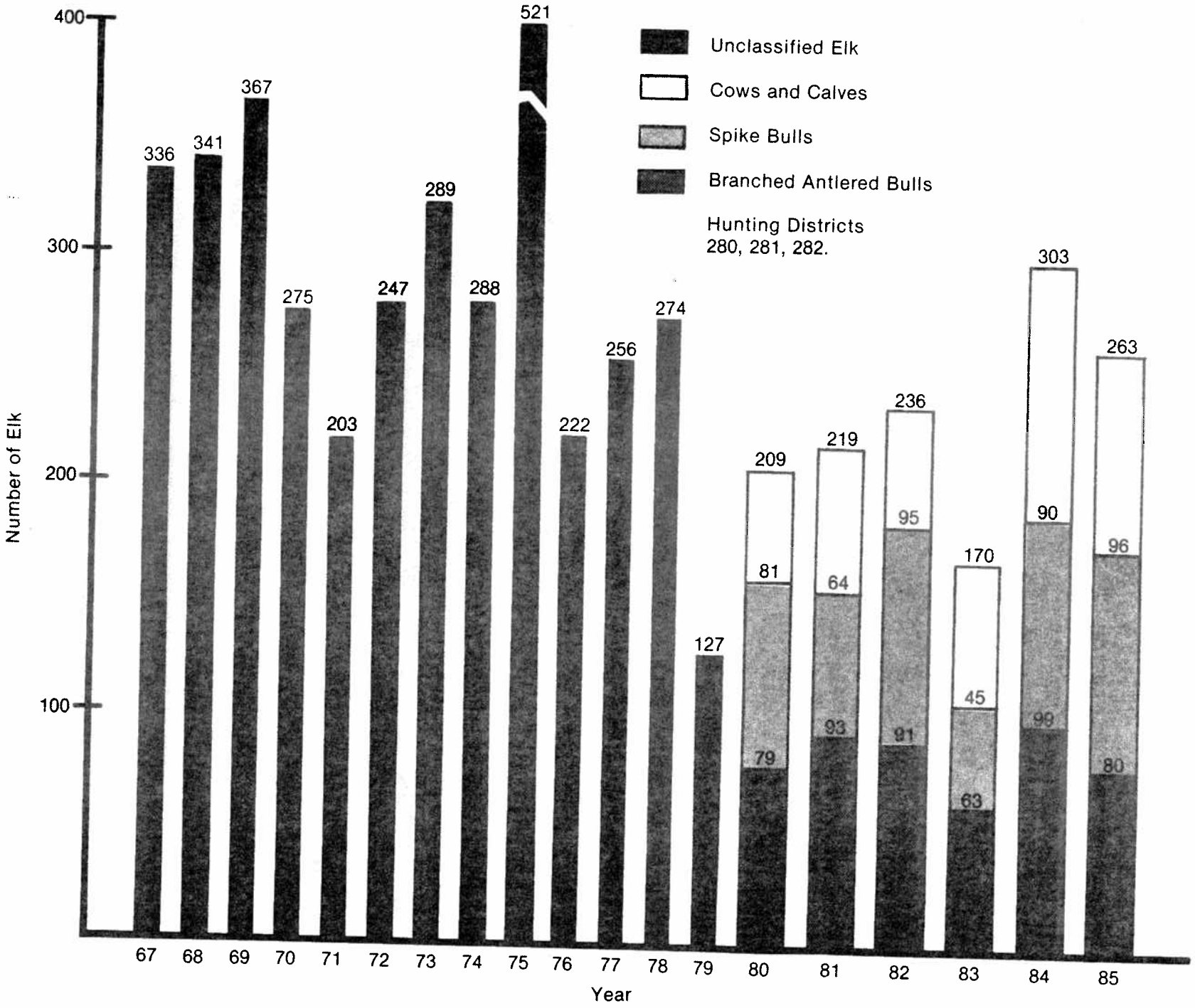
[2] In 1964 and 1965 HD 28 included the Blackfoot-Clearwater Wildlife Management Area (now HD 282), as well as HD's 283, which extends down the Blackfoot and Clark Fork Rivers to Missoula, and 285, west of the Clearwater River to the North Fork Blackfoot, until 1973 when the district number was changed to HD 283. From 1973 to 1983 it included what is now HD 285.



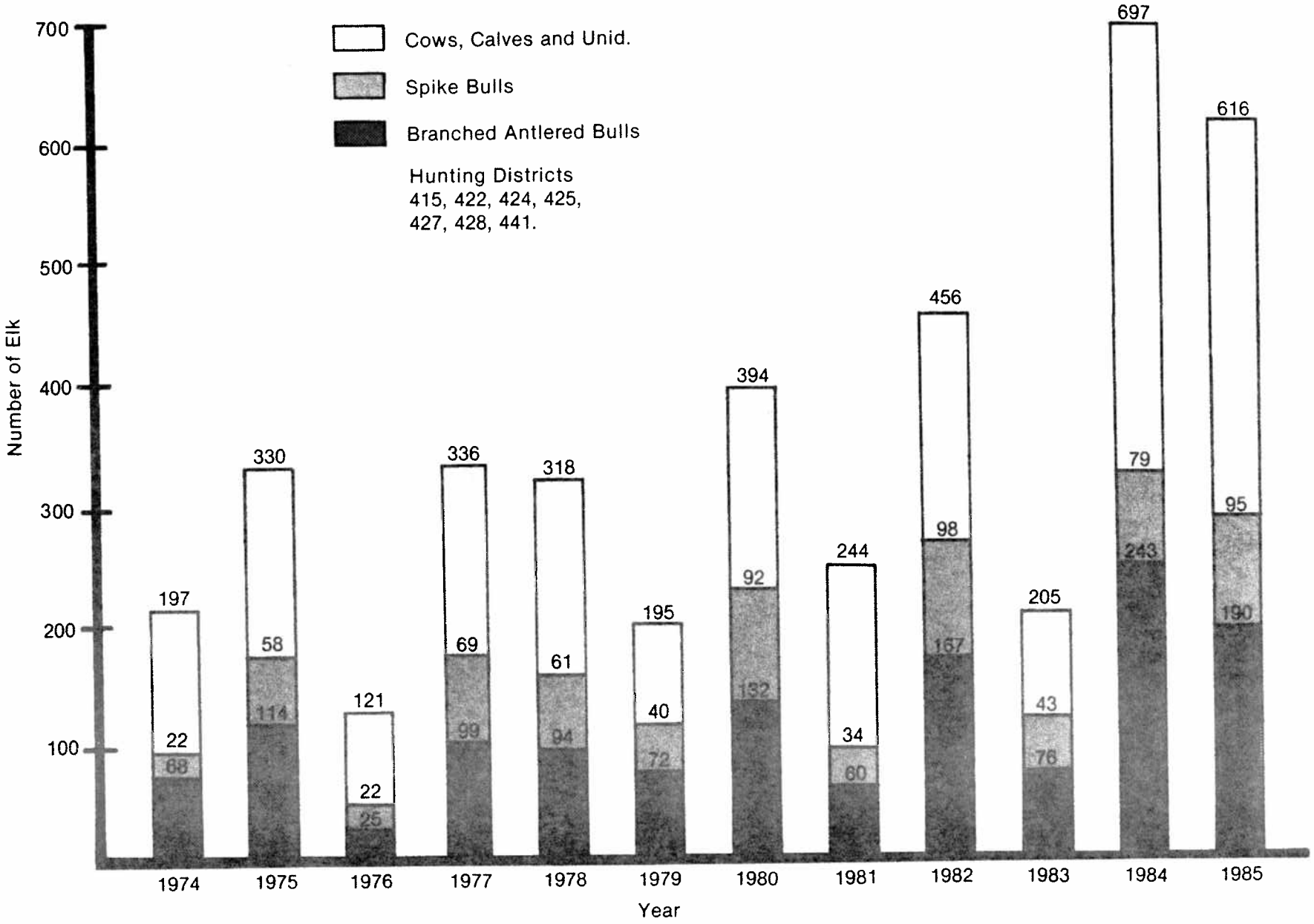
Appendix 9. Elk Harvest in the BMWC Elk Ecosystem (combined check station and questionnaire data.)



Appx. 10. Elk Harvest in Region 1 of the BMWC Elk Ecosystem



Appx. 11. Elk Harvest in Region 2 of the BMWC Elk Ecosystem



Appx. 12. Elk Harvest in Region 4 of the BMWC Elk Ecosystem (Sun River check station data)

Appendix 13. Percent composition of bull elk harvest in Regions 1, 2, 4, and the BMWC elk ecosystem.

	TOTAL BWMC			REGION 1 BMWC			REGION 4 BMWC			REGION 4 BMWC		
	NO. BULLS		%	NO. BULLS		%	NO. BULLS		%	NO. BULLS		%
YEAR	HARV.	BAB	SPIKE	HARV.	BAB	SPIKE	HARV.	BAB	SPIKE	HARV.	BAB	SPIKE
1964			525	71	29			134	67	33		
1965			312	77	23			354	73	27		
1966	1240	66	34	789	65	35	114	90	10	337	61	39
1967	1181	67	33	594	65	35	151	59	41	436	73	27
1968	1011	73	27	520	72	28	171	74	26	320	74	26
1969	835	70	30	407	53	47	190	100	0	238	73	27
1970	1344	72	28	669	79	21	210	75	25	456	61	39
1971	1158	70	30	711	72	28	150	66	34	297	67	33
1972	994	70	30	512	75	25	150	71	29	332	61	39
1973	1227	67	33	712	66	34	154	77	23	361	65	35
1974	830	72	28	560	70	30	124	84	16	146	71	29
1975	1062	66	34	589	68	32	231	64	36	242	62	38
1976	687	79	21	476	83	17	140	69	31	71	68	32
1977	1044	70	30	696	77	23	165	62	38	183	52	48
1978	812	68	32	423	73	27	186	69	31	203	57	43
1979	579	74	26	396	73	27	73	74	26	110	77	23
1980	907	60	40	443	69	31	160	49	51	304	52	48
1981	816	58	42	488	60	40	157	59	49	171	53	47
1982	985	64	36	528	72	28	186	49	51	271	61	39
1983	814	59	41	508	59	41	108	58	42	198	57	43
1984	1295	56	44	669	58	42	189	52	48	437	55	45
1985	1023	62	38	481	74	26	176	45	55	366	54	46