The Mount Jumbo Management Plan

Mount Jumbo Stewardship Subcommittee
The Citizens Advisory Committee on Open Space
The Missoula Parks and Recreation Department

June 1999

In appreciation of those who devoted many hours to the Mount Jumbo Management Plan

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Of the Citizens Advisory Committee on Open Space

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Mount Jumbo Management Plan Chapter One

—Planning Process & Plan Elements—

Adopted by the Stewardship Subcommittee and Open Space Advisory Committee on January 22, 1998. Adopted by the Missoula City Council on October 19, 1998.

On March 27, 1997 the Missoula community acquired Mount Jumbo. A cornerstone of Missoula's urban area open space system, Mount Jumbo is recognized for its natural values as conservation land, for its visual importance, and for its recreational potential. To ensure preservation of the mountain's natural resources and to provide for compatible recreation, the City's Open Space Advisory Committee appointed a Stewardship Subcommittee to develop a management plan for the mountain.

This chapter provides the context for the Mount Jumbo Management Plan. It describes direction the community has already given for Mount Jumbo's management, outlines the planning process, and supplies management objectives.

Missoula's Open Space System

Missoula's landscape is a mosaic of agricultural, forest, grassland, rural, residential, commercial, industrial, and urban uses. In the past, agriculture and forestry were the dominant land uses. These activities were generally compatible with the maintenance of conservation resources such as Mount Jumbo.

During the past twenty-five years, however, Missoula's land use pattern has changed and landowners have faced increased pressure to subdivide and develop open lands. The Missoula urban area grew from 58,263 residents in 1970 to 76,016 residents in 1980, an increase of 30%. Growth slowed during the 1980s, but since 1990, Missoula has experienced a housing construction boom. Rural and urban fringe areas such as Mount

Jumbo have experienced increasing development activity. Although Missoula County contains a substantial amount of public land, natural resources such as elk winter range and scenic open space are largely found on private lands undergoing extensive development.

Recent development pressure has spurred the community's interest in open space preservation, although recognition of the importance of open space is not new. Missoula's Master Plan, adopted in 1968 by the City and County, calls upon the community to "preserve mountainous areas and water courses in the Planning Area for future generations." Updates of the plan in 1975 and 1990 reaffirm public policy of open space land protection and call for preservation of open space land containing valuable natural resources. In the fall of 1991 the Citizens Advisory Committee on Open Space recommended that citizens and public agencies commit to achieving an urban area open space system by working jointly to develop an open space plan. Work began in earnest with a 1994 pilot project; City and County governments adopted the completed *Missoula Urban Open Space Plan* in August 1995.

The *Open Space Plan* envisions an **open space system** distributed throughout the Missoula Valley by the year 2010. Parks and conservation lands are central components of this system; agricultural lands and the urban forest are complementary elements; and views and vistas and trails link the system. The plan identifies "cornerstones," key elements, existing and potential, that form the system's backbone. Cornerstones are important parks and conservation lands, such as Greenough Park, Playfair Park, Fort Missoula, the Clark Fork River corridor, and Mount Jumbo. While many lands represent more than one type of open space, no single parcel can provide all potential public benefits. Nonetheless, the growing open space system is intended to meet diverse public desires.

History of the Mount Jumbo Acquisition

In 1976 the Missoula County Parks, Recreation, and Open Space Plan noted the visual significance of Mount Jumbo and called for its protection as a cornerstone of Missoula's open space system. The 1985 *Inventory of Conservation Resources for Missoula County*, compiled by Bruce Bugbee and Associates, counts Mount Jumbo as "among the key open space lands viewed from the urban area." A 1992 update, produced by the Missoula County Rural Planning Office, notes the importance of Mount Jumbo's elk winter range, recreational and scenic opportunities, plants, and glacial Lake Missoula shorelines.

The City began the quest to preserve Mount Jumbo with a 125-acre purchase in 1989, using $49,000 of 1980 open space bond money. In following years, Mount Jumbo was increasingly threatened by land uses incompatible with conservation of the mountain's ecological, recreational, scenic, and historic resources. Mount Jumbo's zoning designations varied from four houses per acre to one house per 40 acres, allowing a total of 383 houses to be built in the saddle area. Development of the saddle would have cut off the migratory path of elk from the northern wilderness areas to their winter range on Mount Jumbo's southern slopes.

In the summer of 1995 Five Valleys Land Trust, with support from the Rocky Mountain Elk Foundation, began to acquire purchase options on four Mount Jumbo parcels, totaling 1,600 acres, and began a campaign to raise the $3.3 million needed. The Rocky Mountain Elk Foundation pledged a $100,000 challenge grant. Over the next few months, fundraising continued and the Montana Department of Fish, Wildlife and Parks committed $280,000 of Habitat Montana funds to the project.

The Five Valleys Land Trust Mount Jumbo Campaign represented a tremendous community effort that included numerous fundraising events and generous contributions from many citizens of time, energy, and money. Some of the organized events included benefit get-togethers, garage sales, the Mount Jumbo Fun Run, and the efforts of children who earned and donated money. The City of Missoula supported Five Valleys' effort; in August 1995 the City Council passed unanimously a resolution expressing support for the public acquisition of Mount Jumbo to preserve its wildlife habitat and other natural values. Later that month the City set a municipal election for a $5 million open space bond.

City residents passed the open space bond in November 1995. The bond money was earmarked for acquisition of "cornerstone" lands identified in the Open Space Plan, such as Mount Jumbo, as well as for dedicated recreation sites and trails. In recommending use of up to $2,000,000 of 1995 open space bond money towards the purchase, the Citizens Advisory Committee on Open Space recognized Mount Jumbo primarily as conservation land and secondarily for its visual importance and trail potential.

Fish Wildlife and Parks purchased the 40-acre Warner property and 80 acres of the Klapwyk property in spring of 1996. In July 1996 the City purchased the remainder of the $2,750,000 Klapwyk property using $2,000,000 of open space bond funds and money contributed to the Five Valleys Land Trust Mount Jumbo Campaign.

The Mount Jumbo acquisition was completed in March 1997 when the Forest Service acquired nearly 140 acres from the City using $250,000 in Land and Water Conservation Funds. The City, in turn, used that money to purchase the 225-acre Smith property from Five Valleys Land Trust and an adjoining 335-acre property from Gordon Henson. Conservation easements, held by Five Valleys, were placed over both the Smith and Henson parcels. These easements prohibit many actions that might cause environmental degradation and restrict certain activities, such as construction of buildings and new roads, game farm operations, and planting non-native vegetation.

Planning Process Overview

In the winter of 1995-96, the Open Space Advisory Committee appointed a citizen panel, the Mount Jumbo Stewardship Subcommittee, to coordinate public involvement and the development of a comprehensive management plan for City property on Mount Jumbo. Additionally, the planning process was to serve as a prototype for the development of management plans for other new additions to the open space system. The Subcommittee included Open Space Advisory Committee members, Fish Wildlife & Parks and Lolo National Forest staff, and concerned citizens possessing expertise in areas such as botany, wildlife biology, and recreation.

In July of 1996, in anticipation of additional open space bond acquisitions, the City revised its Parks, Trails, and Open Space Ordinance to better address management of conservation lands. The ordinance is intended to work hand-in-hand with management plans tailored specifically to each cornerstone open space acquisition. The revisions define conservation lands and provide management tools, including temporary closures on behalf of wildlife, erosion control, and land rehabilitation activities.

The *Mount Jumbo Management Plan* addresses the original 125-acre parcel purchased by the City in 1985 and the entire 1,600 acres originally optioned by Five Valleys Land Trust, including 120 acres held by Montana Department of Fish, Wildlife & Parks and 138.5 acres held by the Lolo National Forest. In addition, the Management Plan suggests ways to work cooperatively with neighboring private landowners to reduce foreseeable conflicts. Although the biological systems on Mount Jumbo affect, and are affected by, a much larger ecosystem, this initial planning effort is limited to the immediate area held in public ownership.

In developing its approach and areas of management emphasis, the Stewardship Subcommittee solicited input and expertise from interested citizens and organizations by various means, including two public scoping meetings. In February 1997 the Stewardship Subcommittee held a public open house on the draft Elk Winter Range plan. A public open house on the vegetation, natural and cultural resources, planning process, and recreation preliminary chapters was held in May, 1997. Those chapters were revised based on citizen and agency input and presented at an open house in October, 1997. The preliminary education chapter and a sketch of the maintenance plan were also presented October. Each chapter was subsequently revised. The Recreation and Education chapters were adopted by the Stewardship Subcommittee and the Open Space Advisory Committee in December, 1997. The Natural and Cultural Values, and Planning Process chapters were adopted by the Stewardship Subcommittee and the Open Space Advisory Committee in January, 1998. The Vegetation chapter was passed by the Stewardship Subcommittee and amended and adopted by the Open Space Advisory Committee in July, 1998. It was amended and adopted by the City Council in May, 1999.

The plan is intended to be a flexible administrative instrument to be amended according to changing conditions and additional knowledge. Several management strategies will incorporate review mechanisms, such as the annual analysis of the March 15 opening date and the review of the vegetation management strategy each fall.

Planning Direction: The "Givens"

The Missoula community has already discussed and made some decisions about Mount Jumbo. The draft management objectives in the following section are based on these "givens" presented at the October 1996 public scoping meetings.

1. The *Missoula Urban Area Open Space Plan* identifies Mount Jumbo as a cornerstone of Missoula's open space system. The Open Space Advisory Committee identified Mount Jumbo first as conservation land and second for its views and vistas and trail potential. According to the *Open Space Plan*:

> Conservation lands exist in a natural state or have been reclaimed to approximate the natural state. They support flora and fauna and their habitat and may also serve as significant areas of floodwater storage and aquifer recharge. Conservation lands are either publicly owned and dedicated to such use or privately owned with a legally binding limitation on use such that maintenance of the natural condition is emphasized (e.g. through conservation easement, deed restriction, or common area management plan). Conservation lands often support secondary uses such as recreation and education, where such activities are compatible.

2. The August 1995 City Council resolution supporting public acquisition of Mount Jumbo lands notes that:

> preservation of important critical Mount Jumbo wildlife habitat in its natural ecological state as open-space lands is prudent and necessary for maintaining healthy Mount Jumbo wildlife and wildlife habitat, especially for winter range for the Mount Jumbo elk herd that winters on Mount Jumbo; and ...preservation of key wildlife and wildlife habitats is also important for the public spirit, heath, and habitat of humans...

3. The City Council resolution setting a municipal open space bond election calls for preserving Missoula hillsides

> in their natural ecological state as open space lands providing wildlife habitat, wildlife sanctuary... preservation of key wildlife and wildlife habitats is also important for the public spirit, health, and habitat of humans.

4. The mission statement of the Mount Jumbo Stewardship Committee states:

> Within Missoula's larger urban area open space program, the conservation lands occupy a central role, in terms of public visibility, plant and wildlife communities and in educational and recreational values. Thoughtful stewardship should strive to emphasize and promote these public values while honoring adjacent landowner rights.

5. The City recently revised its City Parks ordinance to address management of City-owned conservation lands such as Mount Jumbo. The revised ordinance sets out certain basic management rules with the understanding that management plans will provide specific parameters.

6. Two public agencies, Fish Wildlife & Parks and the Lolo National Forest, manage land adjoining City-owned Mount Jumbo land. Fish Wildlife & Parks used public Habitat Funds to buy 120 acres of Mount Jumbo and has adopted a separate management plan. While the City land is generally closer to the urban area and presents special challenges, we should coordinate management with Fish Wildlife & Parks and the Lolo National Forest where possible.

7. The Management Plan will address the entire 1,725 acres.

8. Neighboring landowners and land uses will be honored as far as possible in meeting public land management objectives.

Objectives

Based on direction given by the *Missoula Urban Area Open Space Plan* and subsequent input and review from citizens and agency staff, the Stewardship Subcommittee developed objectives for Mount Jumbo's management. While it is intended that all objectives be attained, an order of management priority has been proposed to provide guidance in resolving conflicts as they may arise. (Objective 1 is the first priority.) Objectives for Mount Jumbo are:

1. Protect and enhance the natural values of Mount Jumbo as conservation land.

2. Maintain the structure and function of native plant communities for their inherent values and as the foundation supporting all other compatible uses.

3. Maintain space and other habitat components allowing native wildlife to continue their traditional use of the property, and maintain viable options to minimize damage to natural resources and private property.

4. Preserve the land's aesthetic values, including views, watchable wildlife, and a sense of "elbow room," that contribute to our community's quality of life.

5. Provide diverse recreational opportunities that are compatible with the above overriding objectives. Manage types, amounts, seasons, and locations of these uses.

6. Interpret the land's geological, cultural, educational, and historical values when such interpretation is compatible with long-term conservation goals.

Organization

The Mount Jumbo Management Plan comprises the following chapters:

Chapter One—Planning Process and Plan Elements: provides the context for the *Mount Jumbo Management Plan.*

Chapter Two—Mount Jumbo's Natural and Cultural Values: describes history, wildlife, vegetation, geology, soils, and contemporary human values.

Chapter Three—Education: provides information on research and educational aspects of Mount Jumbo.

Chapter Four—Recreation: envisions recreational use with minimal restrictions based on personal responsibility. Presents management strategies and user protocol for pedestrians, mountain bicyclists, horseback riders, people with dogs, and paragliders.

Chapter Five—Vegetation: addresses rehabilitation of grasslands, shrublands, and forest communities. Recommends monitoring and describes strategies for weed control and fire management.

Chapter Six—Elk Winter Range: presents management strategies to reduce potential conflicts between elk and recreational activity on Mount Jumbo during winter and early spring. Preliminary draft reviewed by public in February 1997; revised draft was adopted by City Council on June 23, 1997.

Chapter Seven—Maintenance Plan: includes implementation of the Vegetation and Recreation chapters, trail standards, monitoring programs, an historical and archaeological survey, etc. A preliminary draft was developed by the Stewardship Subcommittee; the Missoula Parks and Recreation Department will complete the chapter after the *Management Plan* is finalized.

The Stewardship Subcommittee is developing the *Mount Jumbo Natural Resource Gazette* concurrent with the *Management Plan*. The *Natural Resource Gazette* will provide an in-depth look at Mount Jumbo's natural and cultural resources, including history, wildlife, vegetation, and physiographic features. This background information will supplement the *Management Plan* and will serve as an educational tool.

Agency Responsible for Implementation

The Missoula Parks and Recreation Department is responsible for implementing the *Mount Jumbo Management Plan*. Other agencies will provide assistance, including the Missoula Police Department; Missoula County Sheriff's Department; Missoula City/County Office of Planning and Grants; Montana Department of Fish, Wildlife & Parks; U. S. Forest Service (Lolo National Forest); and the Montana Department of Natural Resources and Conservation.

The Missoula Parks and Recreation Board will appoint a Stewardship Subcommittee, which will monitor the plan's success. If the Stewardship Subcommittee recommends a new or changed strategy, it will determine whether it is within the parameters of the present plan. If the recommended change is determined to be within the parameters of the present plan, the Subcommittee will notify the City Parks Board and the Parks and Recreation Department will proceed with the new treatment. If the Stewardship Subcommittee finds the recommended change to be outside the parameters of the present plan, the City Parks Board will prepare a recommendation for City Council action.

Criteria for Success

The *Mount Jumbo Management Plan* is intended to be dynamic and flexible, with updates as needed to reflect resource and community changes. The following broad criteria will be used to judge how well the plan is working:

- ✓ The plan ensures the integrity of Mount Jumbo's natural resources.
- ✓ The plan is understandable to the public and the implementing agency.
- ✓ The plan is practical to implement and enforce over time.

Mount Jumbo Management Plan Chapter Two

—Mount Jumbo's Natural and Cultural Values—

Adopted by the Stewardship Subcommittee and Open Space Advisory Committee on January 22, 1998. Approved by the City Parks and Recreation Board on August 11, 1998 and by the City Council on October 19, 1998.

This chapter provides an overview of Mount Jumbo's natural and cultural resources, including its history, wildlife, vegetation, geology, soils, and contemporary human values. The Mount Jumbo Natural Resource Gazette contains detailed information about many of these topics.

Much of the information below was compiled by Jack Wright and provided by Five Valleys Land Trust. Historical information was also obtained through a historic background survey completed by University of Montana graduate student David Moyer and from a local historian, Audra Browman. The complete survey is available separately as Appendix A.

History

According to most historical sources, the Salish Indians called the present Mount Jumbo "Sin Min Koos," which roughly translates into "obstacle" or "thing in the way." David Thompson called it "Brown Knowl" when he climbed in on February 26, 1812. Later, Eastern settlers thought Mount Jumbo looked like a sleeping elephant and miners christened a nearby copper mine "Jumbo Lode" in honor of Barnum and Bailey's most famous attraction. Locals saw the landform as a reclining elephant with its rump in the Clark Fork River and its trunk pointing north toward the Rattlesnake Mountains; the round grassy mountain became known as "Elephant Hill." Later, the feature was renamed Mount Jumbo.

Prehistoric Indians camped and hunted on Mount Jumbo, leaving behind arrowheads, spear points and flint and chert fragments. Mount Jumbo provided important resources, including bitterroots and cambium from Ponderosa Pine bark. A Sentinel Pine once

graced the southwest slopes of Mount Jumbo; vandals cut down this medicine tree in the 1930s.

Blackfeet Indians often lay in wait within Hellgate Canyon to ambush Salish and Kootenai hunting parties returning from the Great Plains laden with buffalo hides and meat. According to numerous reports, the entrance to the Canyon became so littered with bones and skulls that French trappers referred to it as "La Porte d' Enfer" or the gate of Hell. To avoid ambush, the Salish Indians may have relied primarily on a trail through Pattee Canyon. Additionally, the Salish, Nez Perce, and Kootenay Indians traversed Mount Jumbo's saddle en route to and from the Great Plains.

Two rock piles have been reported along the trail crossing Mount Jumbo's saddle. Such piles were used by Indians as trail markers and shrines; they were also made by early settlers. Although some Missoulians believe the piles mark prehistoric Indian graves, the archaeological evidence does not support this conclusion.

In 1806 Merriweather Lewis traversed the south end of Mount Jumbo on the return trip of the Lewis and Clark Expedition. The explorers took a sample of mock orange for the plant collection that was later sent to President Thomas Jefferson. In 1859, Army Lieutenant John Mullan directed the construction of a military road from Fort Benton on the Missouri River to Fort Walla Walla in Washington. The Mullan Road, which passed through Hellgate Canyon, became the primary travel route after its completion, eliminating the fear of ambush. During the stagecoach era, however, the Mullan Road was often too muddy for travel and the route over Mount Jumbo's saddle was used as a detour.

The first settlement occurred on Mount Jumbo after the Civil War. In 1866 a veteran named Richard Marshall homesteaded the area east of the mountain, near what is now called Marshall Creek. In 1871 Marshall acquired a patent to this land from the Government Land Office. Later, the Federal Land Bank of Spokane foreclosed on a lien on the Marshall ranch and then sold the property to Albert Klapwyk in 1949. A patent for land in Mount Jumbo's saddle was given to George White in 1872. Some of the remains of the White farm can still be seen; the White family sold the property to the Klapwyks in 1960.

Railroad land grants, homesteads and mining claims began to spread across the landscape as Missoula grew into a retail trade center. Smaller homesteads were merged into larger

ranches, and the Deschamps and Lerch families assembled ranches on the east side of Jumbo. The Klapwyk family eventually ranched most of the west side of the mountain. Irrigation ditches were constructed to flood irrigate hay meadows.

Mining occurred on Mount Jumbo during the late 19th century. During the 1870s a small limestone quarry existed and the portion of the Old Walla Walla Trail that traversed the saddle was referred to as "Limekiln Road." The lime was used in the mortar for bricks and stone foundations in a number of the earliest buildings. Ledges and veins of silver, copper and gold were later discovered. In April 1883, the Missoula Chief quartz lode was discovered on "Elephant Hill." A year later the Fairview and Jumbo lodes were located on the "north end of Elephant Hill." After a brief period of intensive hard rock mining, which lasted until the early 1890s, mining on Mount Jumbo began to slow and eventually stopped by the turn of the century.

Long used for grazing, Mount Jumbo also has long provided recreation. Picnicking has occurred since the 1880s, and for the 1890 Fourth of July celebration one hundred pounds of "red fire" were detonated on the mountain.

The Maintenance Plan and Education chapter address protection of Mount Jumbo's historical sites and artifacts.

Wildlife

The Mount Jumbo ecosystem provides habitat for a wide variety of wildlife species. Big game species such as elk, mule deer, and white-tailed deer are especially prominent. Mount Jumbo provides critical winter range habitat for an elk herd of about 70 animals. Many traditional winter ranges in the region have been lost to housing development, increasing Mount Jumbo's importance as a vital sanctuary for elk.

The saddle is the main migration corridor for elk moving south from higher elevation public lands to the forage and thermal cover found near the mountain's summit. During winter months, elk can be frequently observed grazing on the open slopes above Missoula. The animals tend to feed in morning and evening and to retreat to forested ravines and thickets during the day. During cold winter months elk are vulnerable to stress from predators such as mountain lions. Human intrusion, even by well-intentioned

hikers and cross-country skiers, also causes the animals to expend valuable energy as they struggle through snow in search of safety. Unleashed dogs also cause great harm when they chase elk and deer.

Most elk calve in late May and early June in brushy thickets and other densely vegetated sites north of Mount Jumbo. However, a few elk calves have been observed on Mount Jumbo in open bunchgrass prairies. Elk mostly eat grasses, but they also browse on shrubs such as willows, chokecherry and serviceberry.

Mount Jumbo also supports some 100 mule deer and 100 white-tailed deer. About half the mule deer reside on the mountain year-round, and the remainder use the habitat as winter range. Bighorns have been re-introduced to the cliffs above Bonner and sheep have occasionally been seen on the east side of Jumbo.

The principal mammalian predators on Mount Jumbo are mountain lions, bobcats, red fox, badgers and coyotes. A substantial prey base exists for these predators including snowshoe hares, Columbian ground squirrels, red squirrels, chipmunks, Eastern fox squirrels, voles, and mice. Black bears are quite numerous in a variety of local habitats and are often observed by hikers. Homeowners adjacent to Jumbo regularly report bears in their orchards and gardens. Grizzly bears are found at higher elevations in the nearby Rattlesnake Wilderness Area.

Yellow-bellied marmots have two resident populations on Jumbo, one in the saddle and one on the south-facing slope above I-90. Raccoons, porcupines, long-tailed weasels and striped skunks are among the many other animals found there.

Mount Jumbo provides a diverse habitat for over 100 bird species. Birds of prey utilize the mountain's open expanses and closed-canopy forests. Golden eagles, sharp-shinned hawks, red-tailed hawks, American kestrels, great horned owls, and northern pygmy owls can be observed. Turkey vultures also hunt there and can be seen soaring or perching in dead trees. Bald eagles and osprey ride thermals above the Clark Fork River. A flammulated owl has been photographed on the mountain's east slope.

Blue and ruffed grouse feed on grasshoppers and other insects in the grasslands and brushy draws of Jumbo. Blue grouse "courting grounds" have been discovered on the property. Gray partridges reside on the mountain year-round and turkeys have been observed.

Jumbo is a haven for calliope and rufous hummingbirds. Vast numbers of these tiny migratory birds seek out the mountain during the blooming of currant and gooseberry bushes. Hairy, downy and pileated woodpeckers, as well as northern flickers, feed on insects on conifers and deciduous trees. Even the seldom-seen Lewis' woodpecker can occasionally be found on Mount Jumbo. Walking Jumbo's slopes, it is possible to observe swallows, Clark's nutcrackers, Stellar's jays, magpies, ravens, nuthatches, rock wrens, warblers, kinglets, mountain bluebirds, waxwings, northern shrikes, lazuli buntings, towhees, sparrows, juncos, finches, red crossbills, red-winged blackbirds, grosbeaks, pine siskins, meadow larks, and other bird species.

Jumbo also supports a rich and unusual assemblage of butterflies. Milbert's tortoise shells and mourning cloaks are the first butterflies to be seen in the spring. Northern blues crowd mud puddles on hiking trails and roads. Yellow swallowtails grace afternoon breezes. Orange sulphurs draw nectar from the flower displays. Delicate painted ladies migrate through the area and rest on the mountain.

Reptiles and amphibians also make their homes on Mount Jumbo. The long- toed salamander lives a subterranean life in a range of habitats from grasslands to moist meadows. Breeding occurs in seeps and springs. The same is true for the western toad which can be found in the mountain's Douglas fir forests. Snakes such as rubber boas and western yellow-bellied racers are encountered.

Vegetation

The Mount Jumbo ecosystem contains a rich mosaic of plant communities dominated by grasslands. Lower elevation areas were inundated by the waters of Glacial Lake Missoula, and soils are relatively thin. Such areas are dominated by bluebunch wheatgrass and Idaho fescue. Higher on the mountain rough fescue bunchgrass prairies exist in good condition. Despite the presence of weeds such as knapweed, leafy spurge, cheatgrass, and tumblemustard, Mount Jumbo's grasslands are still relatively intact. They provide examples of the Palouse prairie that once covered the countryside of eastern Washington and of the fescue prairie of the Rocky Mountain front.

The mountain is spectacular in full flower. Sagebrush buttercups are the first flowers to bloom in the spring. Arrowleaf balsamroot turn the mountain yellow in May. The blues of lupine and the reds of clarkia are seen in succession. On windswept sites, bitterroots bloom by the thousands. Mountain douglasia, buckwheat and groundsel hug the ground beside the bitterroots creating some of the Missoula area's most impressive natural rock gardens. A rare plant community type, bluebunch wheatgrass/oval-leaf buckwheat, is found on the south end of Jumbo.

Perhaps the most species-rich communities are the hawthorne thickets. These dense, shrubby environments have evolved around springs and seeps. River hawthorne, serviceberry, chokecherry, wild rose and scores of other plants crowd these rare water sources. Deer often use the thickets as thermal cover on harsh winter evenings.

Native Americans frequently burned Jumbo's grasslands. This prevented the growth of all but a few large ponderosa pines whose thick bark enabled them to survive the fires. During this century, fire suppression has allowed not only pines but Douglas firs to encroach on cooler north-facing slopes and ravines. These shady ecosystems now harbor many plants and animals that may not have been present at the time of Lewis and Clark. Young trees are now dying from summer droughts. Numerous larger trees now contain pine bark beetles. The risk of a devastating fire is increasing.

Geology and Soils

The story of Mount Jumbo’s landform began more than one billion years ago. In this period, known as the Precambrian, Montana lay in the tropics. Sand, silt and clay from now-eroded mountain ranges were washed into a shallow inland sea. These sediments accumulated to fantastic thickness. Reddish hues from iron staining and greenish colors from chlorite clay minerals gave the growing pile of material its distinctive look. Shallow water features such as ripple marks, mud cracks and even rain drop impressions from passing showers were fossilized in the hardening rock. The debris eventually formed bedrock called argillite (shaley-rock) and quartzite (sand-rich). Limestone was formed during periods of marine conditions with abundant calcium carbonate. As the North American tectonic plate rafted northward to its present position, these rocks formed the basement of the continent. Today, the rocks that compose Mount Jumbo are called the Miller Peak argillite, Hellgate quartzite and Newland limestone.

Beginning about 70 million years ago, the Rocky Mountains began to be raised. This event is called the Laramide orogeny. A regional fracture known as the Clark Fork Fault sliced across the region from southeast to northwest. This fault cut directly across the saddle of Mount Jumbo. The land north of the fault has been uplifted relative to the land laying to the south. Folding also occurred. The Bonner Mountain anticline (upfold) lays north of the saddle. Earthquake activity triggered several landslides in the immediate area, including one on the East Missoula side of the saddle. An intrusion of molten rock was injected into the mountain. This dark, slightly greenish-gray rock is called diabase. The contact between ancient bedrock and this igneous melt created the ore bodies that were briefly mined in the late-19th century on Jumbo.

The Ice Age began about two million years ago. Glaciers descended from Canada and blocked the path of the Clark Fork River near Sand Point, Idaho. Water backed up into western Montana creating Glacial Lake Missoula, which filled the Missoula Valley to an elevation of 4,200 feet. When the ice dam suddenly lifted and burst the entire lake explosively poured out across eastern Washington. The Grand Coulee began to be carved. The lake filled and dramatically drained some 40 times. During each lake cycle, the summit of Mount Jumbo was an island and lake shorelines were etched into its sides. Strong winds drove waves against the mountain, creating beaches. Today, these straight shorelines are especially visible in the spring when they retain long lines of snow. Mount Jumbo's saddle was the scene of repeated flood bursts and scouring. The last lake filled the valley about 15,000 years ago and was witnessed by early human migrants from Asia.

Since the end of the Ice Age, soils have developed in the bedrock and sediments of Mount Jumbo. The Natural Resources Conservation Service has identified and mapped 12 soils series on the mountain. Most of these are shallow, gravelly loams formed on steep slopes.

Contemporary Human Values

Mount Jumbo is one of the most visible features in the Missoula region. It is often the first feature observed by those entering the city. From office workers who watch the elk herd through their windows with binoculars to hikers and bicyclists who recreate on its slopes, Mount Jumbo is a silent repository of a past that is unique to Montana. With

vigilance it will continue to offer serenity and beauty to all passersby, and stand as a guardian of one portion of our Western heritage.

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Mount Jumbo Management Plan Chapter Three

—Education—

Adopted by the Stewardship Subcommittee and Open Space Advisory Committee on December 11, 1997. Adopted by the Missoula City Council on October 19, 1998.

Mount Jumbo's accessible and diverse biological communities make it an excellent outdoor classroom for Missoula. Education can increase public awareness about Mount Jumbo's natural and cultural values and help people understand and comply with management strategies. Further, such knowledge can enhance people's enjoyment of the mountain and foster their interest in stewardship.

This chapter explains its relationship to Mount Jumbo Management Plan objectives and describes various educational and research efforts already undertaken. It goes on to provide alternatives for public education, group use of Mount Jumbo, collecting of natural and cultural objects, and research management.

Relation to Management Objectives

Education is essential to inform people about Mount Jumbo's natural resources, management strategies, and user protocol. Education increases people's enjoyment of the mountain and fosters interest in stewardship. With education, people better understand the basis for management strategies and are more likely to comply with them.

In this context, the *Education* chapter relates to each of the management objectives. In particular, it pertains to the several objectives involving protecting natural values and interpreting the land's geological, cultural, educational, and historical values.

Public Education Efforts to Date

For many years, informal nature study has occurred frequently on Mount Jumbo, usually as people hike to identify and appreciate birds, mammals, insects, wildflowers, plant communities, and geological features. These field trips are made by individuals, informal groups, and school groups.

More recently, education about Mount Jumbo's natural and cultural values contributed to the success of the Mount Jumbo campaign to fund the mountain's acquisition. Local organizations such as Five Valleys Land Trust, the Rocky Mountain Elk Foundation, Five Valleys Audubon Society, and the Montana Native Plant Society were instrumental in these efforts.

During the winter of 1996-97, the Montana Department of Fish, Wildlife and Parks, the Lolo National Forest, numerous volunteers, and the Missoula Parks and Recreation Department collaborated on Mount Jumbo wildlife education. Their purpose was to increase public understanding of wildlife needs during the mountain's temporary closure and the development of the *Elk Winter Range* plan.

A formal education program, began in winter 1997, was carried out by the Montana Natural History Center. The program, funded by the City of Missoula, included Mount Jumbo KUFM *Field Notes* broadcasts, flyers, press releases, newspaper articles, and, with the Lolo National Forest, elk viewing and education workshops (see *Appendix A*). During the spring and summer of 1997 the Montana Natural History Center, the Lolo National Forest, Five Valleys Land Trust, and the Missoula Parks and Recreation Department jointly sponsored a lecture/field seminar series.

Additionally, the planning process employed by the Mount Jumbo Stewardship Subcommittee provided considerable public education on topics ranging from user etiquette to Mount Jumbo's history to the effects of various weed control techniques. In the spring of 1997, Five Valleys Land Trust, the city of Missoula, and the Lolo National Forest provided seed money for a long-term stewardship education program to be developed by the Montana Natural History Center.

Management Plan Research Efforts to Date

Over the years, a good deal of formal natural science research has occurred on Mount Jumbo; an example is the long-term study of migratory songbirds conducted by University of Montana researcher Dr. Erick Greene. In addition to these many projects, the management planning process recently has initiated several research efforts, including:

1. *Mount Jumbo Noxious Weed Catalog*—contracted by the City of Missoula and paid for by the City and the Five Valleys Land Trust Mount Jumbo Stewardship Fund. This mapping project, completed in October 1997, provides valuable baseline and planning information for the Mount Jumbo *Vegetation* plan.

2. *User Tally*—conducted by a citizen frequenting the mountain several times per week, the tally spans from April 1, 1997 through the present. It provides important baseline information for the *Recreation* plan.

3. *User Survey*—presently ongoing. Parks Department staff is conducting a survey to better understand people's use of the mountain and to establish baseline information.

4. *Landowner Survey*—presently ongoing. A mailing to 95 people owning land adjoining Mount Jumbo is focusing their concerns about vegetation and public use.

5. *Elk Pellet Survey*—conducted in the spring of 1997. Provides baseline information about elk winter use. To be conducted annually.

6. *Five Valleys Land Trust Conservation Easement Baseline Studies*—completed for the former Smith and Henson properties. The baseline studies will be included in the *Maintenance* chapter.

7. *Historical Survey*—a University of Montana graduate student has submitted a proposal for a historical and archaeological survey. The survey will be included in the *Maintenance* chapter.

Issues

Issues related to education and research are:

1) public education as a management tool, to encourage stewardship

2) education to lessen impacts on wildlife species sensitive to disturbance and sensitive plant communities,

3) management of groups, and

4) collecting of plants, animals, rocks, and cultural objects

Management Strategies

1. Public education

Mount Jumbo contains many sensitive biological communities. Elk and deer are vulnerable to disturbance during winter and early spring. Rare alpine plant communities are sensitive to trampling or depletion, unknowing users can spread noxious weed seeds, and recreationists who use muddy trails can contribute to erosion.

Public comment on the preliminary draft of this chapter supported development of a long-term, structured stewardship education program for Missoula schools and the Missoula community. Such a program will:

1. Increase public knowledge of Mount Jumbo's natural and cultural values, thus increasing people's enjoyment of the mountain,

2. Involve school groups and volunteers in stewardship activities, and

3. Increase public awareness, knowledge, and understanding of the *Mount Jumbo Management Plan*, thereby increasing compliance with user protocols and use restrictions.

2. Ways of providing education

Education will be provided both on- and off-site. Interpretive signs and/or brochures will provide self-guided on-site education, and guided field trips will continue. An educational kiosk is permitted by the conservation easements across the southern end of the mountain, although building a structure would be some time away.

"Off-site" interpretation and education will be provided through materials circulated to schools and to the general public. These may include traveling educational trunks, books, reference materials, films or slide shows, reference plant or animal collections, a directory to community resource people, and a WEB site.

Interpretive signs could also be placed offsite in areas some distance from Mount Jumbo. These would be placed in areas that provide good views of the mountain and its more "viewable" wildlife, such as elk during winter.

3. Group use of Mount Jumbo

Field trips and other outings, such as organized hikes and mountain bike rides, involve groups of people. The potential for negative impact on wildlife and plant communities is increased when people travel in groups, particularly when they are exploring off-trail.

The Missoula Parks and Recreation Department will sponsor a voluntary advance registration system for organized groups. Advance registration will provide group leaders with such information as times to avoid concentrated use, trails and access points, user protocol, natural history information, and wildlife viewing ethics. Group registration will also provide the Parks Department with valuable management information.

4. Collecting of plants, animals, rocks, and cultural artifacts

People often collect plants, animals or rocks while enjoying the outdoors. Collecting can deplete rare species and reduce the ability of native plant communities to withstand non-native plant invasions effectively. Collecting rocks

reduces the area's natural values; collecting cultural artifacts is illegal. Collecting wildflowers depletes seed sources and is strongly discouraged. (Collection, or hand pulling, of noxious weed species may be beneficial and is outside the realm of this discussion—please refer to the *Vegetation* Chapter.)

Collecting for recreational purposes is strongly discouraged. Advance registration with the Parks Department is required for educational or research purposes.

5. Research on Mount Jumbo

Monitoring programs are central to the success of Mount Jumbo's management. Staying informed about and coordinating with other current research projects will contribute to better management decisions. By acting as a central research warehouse, the City can also help avoid research duplication and encourage research that addresses important management issues. Additionally, information on sensitive plant and animal species and archeological sites can be made available to prospective researchers.

Researchers using Mount Jumbo must first register with the Parks Department.

Acknowledgements

We appreciate the assistance of those who devoted many hours to help develop the Mount Jumbo Education chapter, including:

Janet Sproull, Chair, Recreation Working Group
Bill Ballard, Chair, Mount Jumbo Stewardship Subcommittee
Jim Berkey, The Five Valleys Land Trust
Joe Glassy, Former Chair, Mount Jumbo Stewardship Subcommittee
Noreen Humes, The Five Valleys Land Trust
Mary Manning, Mount Jumbo Stewardship Subcommittee
David Moyer, Graduate Student, The University of Montana
The Montana Natural History Center
Minie Smith, Mount Jumbo Stewardship Subcommittee
Kate Supplee, Missoula Parks and Recreation Department

Mount Jumbo Management Plan Chapter Four

—Recreation—

Adopted by the Stewardship Subcommittee and Open Space Advisory Committee on December 11, 1997. Adopted by the Missoula City Council, with the attached resolution, on October 19, 1998.

This chapter provides a recreation management framework that meets public needs as far as possible while protecting Mount Jumbo's natural values. The strategy envisioned calls for a high degree of personal responsibility to support minimal restrictions on public use. This chapter complements other parts of the plan, particularly the Education chapter.

Chapter Contents

I. Planning Process: places the Recreation chapter in the context of the *Mount Jumbo Management Plan* and outlines the public process to date.

II. Recreation Plan Objectives: describes recreation objectives for Mount Jumbo.

III. Existing Conditions: provides information on existing ordinances, outlines monitoring efforts and results, and describes access points and existing trails.

IV. Recreational Uses: describes concerns and protocol for all users. Describes management strategies and protocol for walking, horseback riding, mountain biking, walking dogs, hunting, paragliding, and other permitted uses.

Appendices: available under separate cover.

I. Planning Process Overview

The Mount Jumbo Stewardship Subcommittee of the Open Space Advisory Committee began developing a management plan for the mountain in the winter of 1995-96. The Subcommittee consists of citizen and agency volunteers supported by Missoula Parks Department staff.

The *Planning Process and Plan Elements* chapter provides detailed information on the *Mount Jumbo Management Plan*. The *Recreation* chapter is intended to address the objectives of the *Mount Jumbo Management Plan* and to complement other elements, particularly *Education*, *Elk Winter Range*, and *Maintenance Plan* chapters. Each of these chapters is available from the Missoula Parks and Recreation Department.

Given Mount Jumbo's primary status as conservation land, the *Mount Jumbo Management Plan* calls for a closure of much of the mountain during the winter to protect wildlife habitat (see the Elk Winter Range Chapter). The *Recreation* chapter, therefore, deals with human use of Mount Jumbo mainly during the spring, summer, and fall.

A preliminary draft of this chapter was presented at the May 13, 1997 Mount Jumbo open house. That draft provided information about recreation on Mount Jumbo and presented various alternatives for pedestrians, horseback riders, mountain bikes, people walking dogs, and paragliders. The draft was revised based on public and agency comment and the revisions presented at the October 8, 1997 open house. Additionally, surveys were made of users and adjoining landowners. Based on this information and further public comment, the chapter was revised and subjected to a formal public hearing before City Council.

Like other chapters of the *Mount Jumbo Management Plan*, the Recreation Plan is intended to be a flexible and dynamic instrument and will be updated as needed.

II. Recreation Plan Objectives

Mount Jumbo's greatest contributions to Missoula's open space system consist of its conservation values. For this reason, the overriding objective of the *Mount Jumbo Management Plan* is to preserve the land's natural resources. An important secondary management objective is to provide diverse recreational opportunities and to manage the types, amounts, seasons, and locations of those public uses.

This chapter envisions a variety of recreational opportunities on Mount Jumbo, supported by sound management strategies that encourage minimal impact on the land and foster good relations among various user groups. Aldo Leopold wrote: "a thing is right when it tends to preserve the integrity, stability and beauty of the biotic community. It is wrong when it tends otherwise." [1]

What is wrong and right on Mount Jumbo will not always be clear. Human use of the mountain is increasing, accompanied by greater potential for both user conflicts and environmental damage. Monitoring future use for social interactions and resource impacts will be a key to maintaining the balance between maintaining Mount Jumbo as conservation land and providing diverse recreational opportunities.

This chapter provides guidelines and direction to foster respect for both the mountain and other people. Public education and personal responsibility are critical to the success of this approach.

III. Existing Conditions

A. Existing Regulations and the Mount Jumbo Management Plan

Public use of open space lands such as Mount Jumbo is regulated primarily by the City Parks, Trails, and Conservation Lands Ordinance (Appendix C). The Parks, Trails, and Conservation Lands Ordinance is intended to work hand in hand with land management

[1] Leopold, Aldo, 1949. In A *Sand County Almanac*, Oxford University Press, 228 pgs.

plans, which are designed to be flexible, dynamic administrative instruments tailored to specific properties.

City ordinances exclude motorized vehicles from open space lands, thus uses such as all terrain vehicles (ATVs) and motorcycles are not considered in this chapter. Additionally, it is unlawful to start a fire, to camp overnight, and to cut down trees or break off tree branches. Open space lands are closed between eleven p.m. and six a.m. daily. Lands may be closed temporarily to protect either natural values or human health and safety. Areas may be closed to permit management actions such as fire prevention work and habitat or trail improvement. Additionally, the Missoula Municipal Code prohibits alcohol in any City open space that does not have restrooms, such as Mount Jumbo.

Montana State law mandates that hunting within City limits is unlawful. Bow hunting is allowed on Fish Wildlife and Parks land, however, and is addressed at the end of this chapter.

B. Level of Use

Several monitoring efforts took place during the spring, summer and fall of 1997: a user tally, which focused on the saddle and north part of the mountain, a landowner survey, and a user survey over all the mountain. These efforts are still underway; results will be incorporated into the final draft of this chapter. Although most of the mountain is little-used, use is expected to increase with increasing public awareness of the mountain and as Missoula's population grows.

Undesirable effects of increased use could include negative impacts on other users, wildlife, or vegetation, and/or unwanted trail development. Present and future monitoring will address these concerns and the *Recreation* chapter revised if necessary. The *Maintenance* chapter describes systematic long term monitoring.

C. Access

There are three main public access points to Mount Jumbo:

On the West Side:

1. *Lower Rattlesnake: Cherry Street and Poplar Street* both provide access to the "L" trail and to the U.S. West Access Road. There is also limited access via Taylor Street and Prescott School. Pedestrians are the primary users and parking is limited.

2. *Lincoln Hills Drive to Tamarack Drive:* provides access to the logging road system in the saddle and behind Danny O'Brien Gulch. Mount Jumbo adjoins public right of way for almost the full length of this road. This access is popular among pedestrians and bicyclists and is the primary access for nature walks. There is some shoulder parking just past the end of the pavement on Lincoln Hills Drive.

On the East Side:

3. *Marshall Canyon Forest Service road*: provides access to the east side of the mountain and is the primary access point for horseback riders and mountain bikes who follow the main logging road to the saddle. Parking is somewhat limited at the gate off Marshall Canyon Road.

Mount Jumbo also can be reached from the north via the Woods Gulch Trail across Forest Service land. At this time there is no public access from East Missoula

Concerns

Lack of Parking: this is already a concern among lower Rattlesnake residents; it could become a problem at other access points as well.

*Crowding at Access Point*s: varies. The trail from Cherry/Poplar Street can be congested before it passes onto a flat bench, from which users disperse. The Lincoln Hills access allows users to disperse onto a variety of trails from the saddle. Access

through Marshall Canyon, by contrast, is confined to a single logging road for over a mile from the parking area, but minimal use has prevented crowding.

Access by Trespass: historically, for many neighborhoods flanking Mount Jumbo, the mountain was viewed as a locally acceptable trespass area shared by neighbors and friends. However, many adjoining landowners are concerned about increasing trespass across their property as outside neighborhood use increases

Wheelchair Access: wheelchairs are welcome in all areas that can be negotiated. The saddle area may offer terrain gentle enough for wheelchair accessibility. The City is currently developing trail standards that will be compatible with new draft guidelines for recreation facilities in outdoor developed areas.[2] Mount Jumbo trails will be re-evaluated when these standards become available.

D. Existing Roads and Trails

Mount Jumbo is crisscrossed by a variety of trails and roads that remain from previous human activity. Many small foot and game trails are also found. Some are shortcuts or provide access from adjacent houses (see above). Not all trails are suitable for general use. It will be necessary to evaluate the trails together with the needs of the recreational users during the spring, summer, and fall. Such work is outlined in the Maintenance Chapter. Initially, however, Mount Jumbo users will be encouraged to use the major existing trials and roads described below. The various routes can be divided into three groups: Southern Trails, Saddle Area Trails, and Northern Trails.

Southern area trails are fairly steep hiking trails that traverse the large open grasslands seen from the City. In addition to the three major trails listed here, the southern area is criss-crossed with an uncoordinated network of random trails. Primary southern trails include:

1. *The "L" trail from the lower Rattlesnake* proceeds up to the whitewashed "L," which is maintained by Loyola Sacred Heart High School. This trail is quite steep

[2] *Recommendations for Accessibility Guidelines: Recreation Facilities & Outdoor Developed Areas.* U.S. Architectural and Transportation Barriers Compliance Board, July 1994.

and eroded in places. It is open year-round.

2. *The trail from "L" to the summit* is used by paragliders to access the top of Mount Jumbo. This trail is also steep and eroded in places.

3. *The U.S. West Access Road above I-90* is fairly level, but dead-ends near East Missoula. Bicycle commuters might benefit if a connection can be made to East Missoula. This trail is open year-round.

4. *The trail from the US West easement to the summit* is quite steep and eroded in places.

Saddle area trails are relatively level and, like the southern trails, traverse mostly grasslands. These are less visible from the City and include:

1. *Lincoln Hills to Tamarack Drive*, an unpaved extension of Lincoln Hills Drive, is open to non-motorized use year-round. It will be barricaded to motorized vehicles.

2. *The Saddle Trail* traverses the saddle roughly under the powerlines. This road is the dividing line for the north and south winter elk range closure zones. It is also the access for the Northern Loop of about three miles.

3. *The "Backbone Trail*" is an old jeep road leading south to summit and continuing as a footpath connecting to about the "L" trail. This trail is quite steep and eroded in places.

Northern trails include a combination of roads and trails that connect the saddle area with the higher timbered area to the north. They provide more of a backcountry experience and connect with routes though Fish, Wildlife and Parks land to the Lolo National Forest and Rattlesnake Recreation Area.

1. *The Northern Loop* is a three-mile circular route from the saddle. This loop accesses a number of deadend logging roads and connects both the Saddle and Marshall Canyon to the Ridge Trail.

2. *The Ridge Trail* continues north to the old Sheep Mountain Trail into Woods Gulch in Rattlesnake Recreation area, managed by the Lolo National Forest.

Concerns:

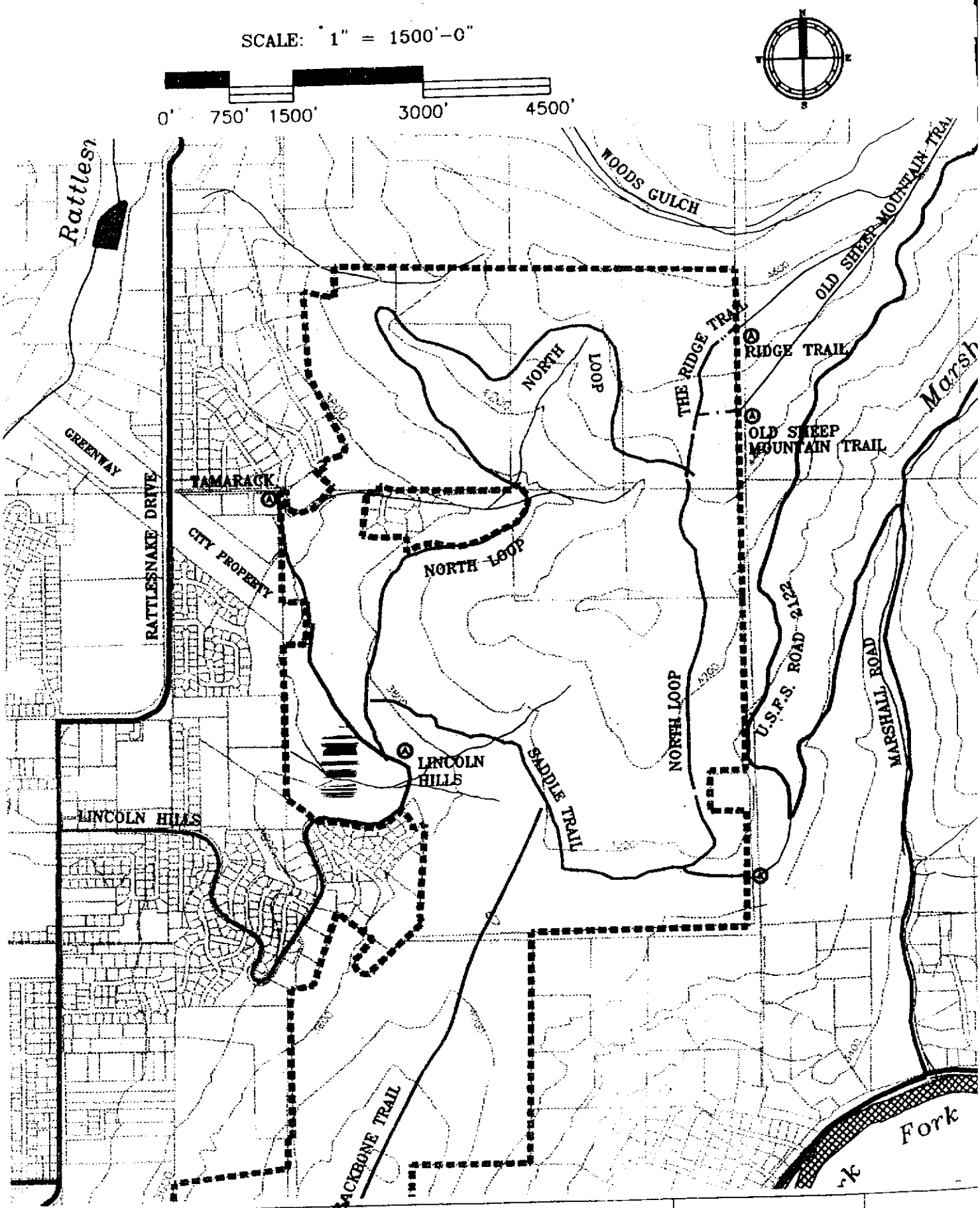
Current Trail Conditions: Many of the trails along old roads are in relatively good condition as far as location, grade, and erosion potential, although some are overgrown with weeds. The trail to the "L" and above, the trail leading to the summit from the US West easement, and the backbone trail are eroded. A few trails are poorly located and need to be redesigned to prevent future erosion. The Maintenance Chapter addresses trail design standards and maintenance. Several organizations that use Mount Jumbo regularly have offered to help with trail improvements.

Trail Development: New trails could offer more links within the existing trail network, but potential additions should be assessed for their affect on overall management objectives. New trails should be visually less intrusive and built to reduce erosion.

The *Maintenance* chapter provides draft trail standards currently being developed by the City. This chapter will discuss trail design and redesign, erosion, water bar placement, natural barriers that keep people on the trails, volunteer efforts such as an adopt-a-trail program.

E. Developed Facilities

There are currently no developed facilities on Mount Jumbo. Educational kiosks may be appropriate at major trailheads and are provided for under the terms of the conservation easements on the former Smith and Henson properties. However, other developed facilities, such as restrooms and barbecue pits, are incompatible with Mount Jumbo's conservation land designation. Such accommodations are not presently being considered.



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IV. Recreational Uses

Concerns

The preliminary draft of this chapter presented individual assessments of pedestrian, mountain bike, equestrian, canine, and paragliding recreation on Mount Jumbo. Within each assessment were listed potential concerns that might arise because of these recreation uses. In broad overview, these concerns fell into one of two categories:

1. *Potential for resource damage*, including contributing to trail erosion, widening and braiding of trails, and damage to vegetation.

2. *Conflict among or between users*, including interactions among hikers, bikers, horseback riders, and people walking their dogs. Where use levels are high, negative interactions can occur.

The protocol provided below and throughout the chapter describe ways for all users to lessen user conflicts and resource damage.

Protocol for All Mount Jumbo Users

Courteous, commonsense behavior is necessary for the success of management strategies that impose minimal restrictions. Various user groups contributing to the planning process developed protocol specific to horseback riding, mountain biking, paragliding, and dog walking. These additional protocol are listed in their respective section. The following protocol are suggested for all user groups:

- Tread lightly, leave no trace–pack it in, pack it out.

- Observe wildlife from a distance.

- Leave wildflowers and native vegetation for others to enjoy and for seeds to bring next year's flowers.

- Respect private property. Be quiet and courteous near homes. Leave closed gates closed and open gates open.

- Near established trails, stay on the trail and avoid short-cutting switchbacks. Travel directly through muddy spots to prevent trail widening, rutting, and braiding; very muddy trails may be closed to prevent damage.

- When horses approach, hikers and bicyclists should move to the downside of the trail to let horses pass. Horses are concerned about being attacked from above. By standing on the downhill side, other users are perceived by the horse as being less of a threat. If threatened, horses will go up the hill, away from people. Horses are more easily controlled and are less likely to fall going up hill.

- Pedestrians and bikers should talk to each horse and rider in a group of horses. The pedestrian or bicyclist should ask for instructions from the rider on how to proceed.

A. Pedestrians

Current Situation:

Mount Jumbo's varied terrain allows hikers to pack a picnic lunch and head up to the summit, walkers to enjoy the songs of meadowlarks in the saddle, and joggers to workout running the north loop road. While most people will stay on trails, some off-trail use may occur for picnics, nature study, photography, etc. While on-trail use is preferred, off-trail use by individuals and small groups is unlikely to cause resource damage.

Management Strategy:

Comments on the preliminary *Recreation* chapter draft supported unregulated pedestrian access based on compliance with user protocol.

Pedestrians allowed everywhere on Mount Jumbo.

B. Mountain Biking

Current Situation:

Public acquisition of Mount Jumbo has provided new bicycle routes, including connections to the Rattlesnake Recreation Area and to Marshall Canyon from the Rattlesnake Valley. Monitoring efforts to date show that most rides are short trips around the northern loop or trips to some other venue. Current bicycle use is relatively low compared to the nearby Rattlesnake National Recreation Area. As Mount Jumbo becomes more widely known, however, the level of use is likely to increase.

Thus far, monitoring has detected neither user conflict nor resource damage. However, concerns about user conflict and erosion remain, particularly regarding mountain bike use of the backbone trail. The management strategy below is predicated on continuing education efforts and adherence to the below protocols.

Additional Protocol for Bicyclists (see pages 33 and 34s 33 and 34 for protocol applicable to all users):

The following recommendations are taken directly from instruction supplied by Low Impact Mountain Bicyclists (LIMB), the U.S. Forest Service, and Adventure Cycling.

- Make contacts with others pleasant, no matter how brief.
- Speak up at first sighting! Try not to startle people and yield to hikers and horseback riders.
- When approaching oncoming livestock on trails, speak, slow down, and move off the trail to the downhill side. When passing livestock from behind, speak out and ask for instructions. Let both livestock and riders know you are a friendly human.
- Ride in small groups and in single file when passing.
- Ride in control and pass others slowly. Slow down for blind corners or where terrain or vegetation causes limited sight distance.

- Respect private property and route closures. Abused privileges are often lost.

- Mountain bikes can damage dry ground when their tires lock in a skid or "spin out" on a steep climb. Bikers can learn to control their speed and use both brakes, using gradual pressure, to avoid a skid. Spinning out can be controlled by keeping the rider's weight over the rear wheel. If a slope is too steep to ride without skidding or spinning out, dismount and walk.

- Walk the bike when you encounter wet areas—don't start new trails.

Management Strategy:

Public comments supported shared multipurpose trails employing the following management strategy:

Shared multipurpose trail use. Safety considerations and the sensitivity of natural values would preclude mountain bikes from the "L" trail, the paraglider trail to the summit, and the trail leading from the U. S. West easement to the summit. The Backbone Trail will be closed to bikes if a solution is not adopted by the City Council before July 1, 1999.

C. Horseback Riding

Current Situation:

Horses and mules have been a continuing presence on Mount Jumbo for many years. Recently, Mount Jumbo has supported commercial trail rides, the grazing of horses, and limited pleasure riding by local residents. Horseback riders presently make up about three percent of recreational users in the RNRA and Rattlesnake Wilderness Area. Although Mount Jumbo may attract more riders in the future, use levels on Mount Jumbo may never be high. The primary access point for horseback riding is in Marshall Canyon.

Neither user conflict nor resource damage has been detected, and this plan is based on the assumption that user protocols will be observed.

Additional Protocol for riders (see pages 33 and 34s 33 and 34 for protocol applicable to all users):

- Horses must be under control of the rider, whether being ridden or used as pack animals. Horses must be ridden at prudent speeds given the ground traction, steepness, visibility, and other users in the area.

- Although horses have the right of way with all other user groups, be polite when meeting others. Common sense should prevail. If there is an opportunity to get off the trail, do so. Horseback riders should "ride friendly - expect and respect other trail users."

- Riders should stay on the trails or roads. Impact on wildlife, soil and vegetation can be minimized by traveling on constructed trails that can better accommodate heavy use. Riders should ride single file on trails to avoid developing braided trails.

- Unleashed dogs are generally not a problem to horses. Many times a horse will react more strongly to a dog straining at the end of a leash because it appears to be aggressive. If a dog must be restrained, it is better to take the dog off the trail, away from the horse.

Management Strategy:

Public comments supported shared multipurpose trails, employing a strategy similar to that for mountain bikers:

> *Shared multipurpose trail use. Safety considerations and the sensitivity of natural values would preclude horses from the "L" trail, the paraglider trail to the summit, and the trail leading from the U.S. West easement to the summit.*

D. Walking Dogs

Dogs accompany many pedestrians on Mount Jumbo. Despite the City ordinance in effect during the summer of 1997, most dogs were off leash. This did not result in any reported conflicts, but there remains a concern that unleashed dogs at trailheads with constricted access could present management problems in the future. This is particularly true for the Southern Trail access points.

Dogs should be prevented from chasing deer and elk. With this exception, however, dogs accompanied by their owner are not considered a threat to any wildlife species on Mount Jumbo.

Additional Protocol for Walking Dogs (see pages 33 and 34 for protocol applicable to all users):

People who bring a dog to the mountain should carry a leash and use it whenever necessary. Dogs should be leashed, held by collar, or under voice or electronic control at all times.

- When two owners with unleashed dogs meet, both should be comfortable with the dogs greeting. If one owner chooses to leash their dog, the other should also do so.

- When meeting a leashed dog, the owner of an unleashed dog should provide room for both dogs to pass without contact.

- When other users unaccompanied by dogs approach, give them the right of way and under no circumstance allow the dog to chase.

- Do not allow the dog to make contact with children. Even the friendliest approach can be a terrifying experience for a child unfamiliar with dogs.

- Sheep and goats may be used on Mount Jumbo for vegetation control. When approaching domestic stock, dogs should be leashed.

Management Strategy for Walking Dogs:

Public comments were divided between allowing dogs off the leash and keeping them on the leash. A slight majority called for allowing dogs off the leash. The following management strategy will be employed and revised as needed. Dog owners should be especially careful to follow the above protocol and to remove their dog's feces from well-used trails, such as the "L" trail. For comparison purposes, Appendix D contains a summary of dog regulations and their effects at Blue Mountain, the Rattlesnake Recreational Area, and Pattee Canyon Recreation Area.

> *Dogs are to be accompanied by their owner, kept under voice control, and the owner should carry a leash for use if needed. From December 1 to March 15 (winter closure), dogs on the "L" trail and U.S. West easement must be kept on a leash.*

E. Paragliding

The Mount Jumbo Paragliding Club has been gliding from Mount Jumbo for many years, and has established both protocol and control. The Club reached agreements in 1990 with two landowners at the south end of Mount Jumbo for the purpose of paragliding. The Club generously has volunteered to assist in restoring the trail to the launch site.

Additional Protocol for Paragliding (see pages 33 and 34 for protocol applicable to all users):

- Pilots must be current members of the United States Hang Gliding Association (USHGA) and fly within the recommended operating limitations of their pilot certification levels. Associated with this membership is Mount Jumbo site liability insurance. This is a blanket covering the USHGA, its members, chapters and any landlord who leases or allows property use to USHGA, Inc.

- Before flying alone, new Novice pilots must fly their first five flights with two different pilots who have flown the site for at least one season.

- Landing anywhere on Mount Jumbo is safe.
- Pilots should call the Missoula Airport tower 549-6001 before flying.
- Pilots will avoid flying over herds of animals or disturbing wildlife.
- Out-of-town pilots must sign a waiver and fly with a local pilot for their first flight. See agreement #3 if the person is a Novice pilot.
- Pilots should know and follow all Federal Aviation Administration Regulations relating to paragliders.

Management Strategy for Paragliding

Paragliding is allowed under the direction and control of the USHGA. The local entity responsible is the Missoula Free Flyers.

F. Bow Hunting

Recreational hunting is an important outdoor activity and wildlife management tool in Montana. However, the hunting opportunity available within the City limits on Mount Jumbo is severely restricted by State laws and municipal ordinances.

State law regarding fish and wildlife prohibits the pursuit of "…any deer within the boundaries of any incorporated or unincorporated city of town of this state." (87-3-305. Unlawful to hunt deer within city or town boundaries.)

Missoula City Ordinance generally prohibits the "…discharge of firearms within the city limits as well as certain designated areas within five miles of the city limits…" ((9,.62 Discharging Weapons). Exceptions (9.62.030 C.) reduce this prohibited radius to:

"*1. Portions of Mount Jumbo lying within one mile of City limits…*"

The current map of city limits shows this restriction applies to all of the Mount Jumbo management area and most of Woods Gulch.

Bow and arrow restrictions are somewhat less limiting (9.62.050), but within the City limits only allow "discharge of an arrow… in a manner so as not to endanger person, property, animal, or fowl…" These restrictions do not apply to Mount Jumbo property outside City limits.

Additional Protocol for Hunting (see pages 33 and 34 six for protocol applicable to all users):

- Archery hunting in any area close to human habitation requires skill and sensitivity to avoid potential conflicts with other recreational users.

Management Strategy for Bow Hunting

> *Those portions of Mount Jumbo within the city limits of Missoula are effectively closed to hunting until such time as existing laws and ordinances are modified.*
>
> *Those portions of Mount Jumbo outside the city limits, purchased by the Montana Department of Fish, Wildlife and Parks and the U.S. Forest Service, are open to bow and arrow hunting during the time period that Hunting District 283 is open to bow hunting. When the Mount Jumbo winter range is closed on December 1, all recreational use is terminated.*

G. Other Uses

There are other permitted uses on Mount Jumbo, such as llama trekking and bird watching. Protocol and management strategies eventually may be developed for such uses as the need arises. In the meantime, users should follow the general protocol described on pages 33 and 34.

RESOLUTION NUMBER 6198

A RESOLUTION TO ADOPT FOUR CHAPTERS OF THE MOUNT JUMBO MANAGEMENT PLAN. THOSE CHAPTERS ARE: PLANNING PROCESS AND PLAN ELEMENTS, MOUNT JUMBO'S NATURAL AND CULTURAL VALUES, EDUCATION, AND RECREATION, WITH THE CONDITION THAT WITH REGARD TO THE RECREATION CHAPTER, A COMMITTEE BE APPOINTED BY THE CITY PARKS BOARD TO FIND A SOLUTION FOR THE BACKBONE TRAIL AND TO ACCEPT THE PARKS BOARD'S RECOMMENDATION TO CLOSE THE TRAIL TO BIKES IF A RESOLUTION IS NOT ADOPTED BY THE MISSOULA CITY COUNCIL BY JULY 1, 1999.

WHEREAS, the City of Missoula has adopted the ***Missoula Urban Area Open Space Plan***, which envisions an urban area open space system by the year 2010; and

WHEREAS, the ***Missoula Urban Area Open Space Plan*** identifies Mount Jumbo as a cornerstone element of Missoula's open space system; and

WHEREAS, Mount Jumbo supports wildlife habitat, native plant communities and other natural values; and

WHEREAS, Mount Jumbo also contains recreational and educational values; and

WHEREAS, the City's acquisition of Mount Jumbo was completed using primarily open space bond money; and

WHEREAS, the Open Space Advisory Committee, its Stewardship Subcommittee, the City's partner agencies and organizations, numerous citizens, and City staff have developed Mount Jumbo Management Plan chapters entitled the Planning Process and Plan Elements, Mount Jumbo's Natural and Cultural Values, Education, and Recreation, that balance protection of Mount Jumbo's natural values with recreational use; and

WHEREAS, the Planning Process and Plan Elements, Mount Jumbo's

Natural and Cultural Values, Education, and Recreation Chapters addresses key Mount Jumbo management objectives identified through extensive public process and derived from the ***Missoula Urban Area Open Space Plan***, the open space ballot language, City Council resolutions, and the City Parks, Trails, and Conservation Lands Ordinance; and

WHEREAS, the Open Space Advisory Committee, its Stewardship Subcommittee, and the Missoula Parks and Recreation Board support the adoption of the Planning Process and Plan Elements, Mount Jumbo's Natural and Cultural Values, Education, and Recreation Chapter;

NOW THEREFORE, BE IT RESOLVED that the Missoula City Council adopts four chapters of the Mount Jumbo Management Plan. These chapters are: Planning Process and Plan Elements, Mount Jumbo's Natural and Cultural Values, Education, and Recreation, with the condition that with regard to the Recreation chapter, a committee be appointed by the City Parks Board to find a solution for the Backbone trail and to accept the Parks Board's recommendations to close the trail to bikes if a resolution is not adopted by the City Council by July 1, 1999.

PASSED AND ADOPTED THIS 26th DAY OF OCTOBER, 1998.

ATTEST: APPROVED:

Martha L. Rehbein
City Clerk

Mike Kadas
Mayor

(SEAL)

Mount Jumbo Management Plan Chapter Five

—Vegetation—

Adopted by the Stewardship Subcommittee on July 16, 1998 and by the Open Space Advisory Committee on July 30, 1998. Adopted by the City Council, with substantive changes made by the City Council Conservation Committee, on May 17, 1999.

This chapter envisions Mount Jumbo as a diverse landscape of native grasslands, shrublands, and forests. Timbered areas will be fire-resistant, park-like forest stands with an understory of grasses, wildflowers, and shrubs. Islands of dense timber will provide hiding cover for wildlife.

The directives for this chapter follow both from given objectives for Mount Jumbo's management and from MCA 7-22-2151, which mandates that the City of Missoula enter into a cooperative agreement with the Missoula County Weed Board.

This chapter describes strategies for restoring grasslands and reducing the risk of wildfire. Mount Jumbo's vegetative community is ever changing and new and better treatments are constantly discovered; for these reasons, this chapter is intended to be a dynamic administrative instrument.

Chapter Contents

C. Desired Condition

D. Grasslands Management Strategies

1. A Strategic Ecological Framework
2. Management Strategy Components
3. Tools
4. Individual Tools Versus Combination Treatments
5. Possible Herbicide/Grazing Combinations for Mount Jumbo
6. Recommendation
7. Annual Evaluation Procedure

Forest includes:

A. Historic Condition

B. Present Condition

C. Desired Condition

D. Forest Management Strategies

1. Fire Management
2. Forest Health Strategy

Appendices: include steps for implementing an integrated pest management strategy, IPM components, demonstration plot treatment options, biological weed control agents, and treatment options for larger areas of the Mountain.

I. Planning Process Overview

The Mount Jumbo Stewardship Subcommittee of the Open Space Advisory Committee began developing a management plan in the winter of 1995-96. The Subcommittee consists of citizen and agency volunteers supported by Missoula Parks Department staff.

The Planning Process and Plan Elements chapter provides detailed information on the *Mount Jumbo Management Plan*. The Vegetation chapter is intended to address the objectives of the *Mount Jumbo Management Plan* and to complement other elements, particularly the Elk Winter Range, Recreation, Education, and

Maintenance Plan chapters. Each of these chapters is available from the Missoula Parks and Recreation Department.

Once the Missoula City Council adopts the *Mount Jumbo Management Plan*, the City Park Board's Stewardship Advisory Committee will name a subcommittee to oversee implementation of the plan. The Missoula Parks and Recreation Department is responsible for implementing the *Mount Jumbo Management Plan* depending on departmental priorities and funding as it becomes available through the City's budget process.

Throughout the course of two open houses and numerous drafts of this chapter, management alternatives have been shaped and re-shaped by public comment, by results of landowner and user surveys, and by committee and agency considerations. A preliminary draft of this chapter was initially presented at the May, 1997 Mount Jumbo open house.

Management alternatives were refined on the basis of public and agency comments and new alternatives presented at an October, 1997 open house. Those attending the open house, as well as adjoining landowners, were surveyed on their attitudes toward vegetation management.

Forest Management Strategy: Public comment on forest management supported maintaining a diversity of tree sizes through ten to twenty year disturbance cycles. The plan incorporates this strategy. Comments on tree removal strategies were sparse and inconclusive; consequently, the plan describes cutting and prescribed burning of slash piles, as recommended by agency staff and biologist volunteers.

Grasslands Management Strategy: The grasslands management strategy was revised several times based on public and agency comment as well as on user and landowner survey results. The most recent changes have resulted largely from working sessions with Roger Sheley, Noxious Weed Specialist from Montana State University in Bozeman. The resulting management strategy utilizes a broad spectrum of techniques set within an ecological framework.

II. Vegetation Plan Objectives

Mount Jumbo features diverse vegetative communities including grasslands, savanna (grasslands with scattered trees), young dense forest, young open forest, mature closed canopy forest, mature open forest, and shrub patches, and thickets. The vegetation plan's objectives are to:

1) **Maintain and restore the structure and function of native plant communities.** For the purposes of this management plan, a plant is

considered native if it was present in the region prior to European settlement. The structure of a native plant community includes its species composition, native distribution, diversity, appearance, and rooting distribution. Elements that define the function of a native plant community include: 1) niche occupation, 2) nutrient cycling, 3) energy flow, 4) carbon and water cycling, and 5) trophic level interactions. In addition, soil stability and soil processes are maintained and restored through the proper structure and functioning of a native plant community.

2) **Maintain and restore native wildlife populations.** Native wildlife populations co-evolved with native plant communities and rely on the structure and function of native plant ecosystems for survival. By maintaining and restoring native plant communities, we will also work towards maintaining and restoring native fauna populations.

3) **Develop and maintain native plant communities that are resistant to non-native plant invasion.** By removing resources from non-native plant species and encouraging a vigorous and healthy native plant community we will develop a system that is more resistant to non-native plant infestations and reduce the threat to native communities. By encouraging resistant native plant communities we will also lower the chances of losing a critical percentage of natives and, in doing so, avoid the difficulties and expenses associated with completely restoring these systems.

4) **Preserve and maintain the land's aesthetic values.** Some of the aesthetic values that relate to Mount Jumbo's vegetation include 1) maintaining a diversity of native wildflowers, forested plant communities, butterflies, birds, and mammals including elk, mule deer, black bear, and mountain lion and other species of watchable wildlife, and 2) maintaining and restoring a landscape with high scenic, recreational, and open space values.

Additionally, the Montana Code Annotated Section 7-22-2151 requires that municipalities within Weed Control Districts enter into cooperative noxious weed management agreements with the respective Weed Boards. The grasslands management plan presented here is intended to serve as a template for the City's noxious weed management agreement with the County Weed District, allowing the City to come into compliance with MCA 7-22-2151.

Enacting a successful vegetation management plan for Mount Jumbo will be a complex and lengthy process integrating many techniques. A "quick fix" or single solution is unlikely. Moreover, a solution for one problem may exacerbate or create another. For example, synthetic herbicide controls for weeds will almost

always increase grasses rapidly, but may be harmful to desirable native forbs and shrubs.

This chapter describes an integrated approach employing strategies suited to various areas on the mountain. Mount Jumbo's vegetation is ever-changing and new treatment options are being found. This plan is intended to be dynamic and will be modified over the years as the mountain's vegetative communities evolve and new information emerges.

III. Grasslands

A. Historic Condition

Historically, grasslands were the largest Mount Jumbo plant community. Spring and summer brought a rich wildflower display and the exotic nonnative plants so prevalent today were nonexistent. Wildlife enjoyed abundant forage and browse year-round. Fires swept through the area on a regular basis, maintaining the grasslands and removing forest undergrowth. Beginning around 1900, fire suppression allowed forest to encroach on much of the former grasslands.

Weeds began to appear in Western Montana during the early to mid-twentieth century, their spread facilitated by motorized vehicles. Easily disturbed and difficult-to-manage sites, such as Mount Jumbo, were particularly vulnerable. Mount Jumbo has been particularly susceptible to weed infestation due to its proximity to an urban area and its subjugation to major transportation corridors of every type, including highways, multiple power lines, and pipelines.

B. Present Condition

At present, approximately 50% of Mount Jumbo's grasslands contain viable populations of native grasses, including Bluebunch wheatgrass, June grass, and Idaho fescue. Noxious weeds include spotted knapweed, Dalmatian toadflax, sulfur cinquefoil, leafy spurge, Canada thistle, St. John's wort, and hound's tongue. In addition, non-native plants such as cheatgrass (downy brome) and Japanese brome infest Mount Jumbo. These aggressive weeds may out-compete native grasses and forbs, resulting in a loss of native plant and animal diversity. Finally, many of these non-native plants provide poor forage for deer and elk, threatening the winter range's viability.

To develop appropriate management strategies and to obtain baseline information it was important to assess Mount Jumbo's grassland condition accurately. Two research projects were completed in the summer and fall of 1997: a catalogue of Mount Jumbo's noxious weeds, and the installation and reading of demonstration plots. Additional baseline research is necessary to characterize existing native plant communities.

1. Baseline Research: Vegetation Plots

During the spring and summer of 1997 volunteers from local secondary schools installed vegetation plots in the saddle area. Plants were inventoried along transect lines within each plot. The presence or absence of native plant species was recorded from half-meter microplots and the diversity of native species was calculated. The density of non-native plant species within each microplot was also recorded.

These plots will continue to be used for monitoring or to act as demonstration plots for various vegetation treatments. Additional plots will be installed in a variety of grassland sites (see discussion of demonstration plots in the research section, page 54).

2. Baseline Research: Noxious Weed Catalog

Noxious weeds within the management area were catalogued in September 1997. The project was funded jointly by the City of Missoula and the Five Valleys Land Trust Stewardship Fund. The project's purpose was:

1. to identify the location, density, and abundance of noxious weeds within the management boundary,

2. to visually display their location,

3. to assess locations where weeds can be controlled at relatively low cost,

4. to predict areas subject to the invasion of new weeds,

5. to provide educational material on noxious weeds, and

6. to provide information necessary to assess the economic impact of the noxious weed invasions and cost of weed control.

The consultant walked the entire 1,725-acre Mount Jumbo management area and reviewed high-resolution color aerial photographs. Seven weeds were mapped: spotted knapweed, Dalmatian toadflax, sulfur cinquefoil, leafy spurge, Canada thistle, St. John's wort, and hound's tongue. The resulting catalog is available for review at the Missoula Parks and Recreation Department, 523-4669.

3. Baseline Inventory: Native Plant Communities

The Noxious Weed Catalog demonstrates conclusively that Mount Jumbo's grasslands are heavily infested with weeds considered noxious by the State of Montana. The design and implementation of effective vegetation management strategies, however, will require an additional inventory that describes the current distribution of viable native plant communities. The baseline inventory will refine our understanding of where appropriate management strategies should be tested and applied on Mount Jumbo. Monitoring will be an ongoing, long-term effort.

Roger Sheley, noxious weed specialist for the State of Montana, has stated that:

- plant communities containing less than 30 percent natives require management strategies that entail complete revegetation programs, and

- plant communities with a percentage of natives above the 30 percent threshold have a much better chance of responding positively to weed control techniques currently available.

C. Desired Condition

Grassland restoration involves both weed control and encouraging establishment of native plants. Weed control does not mean the total eradication of weeds. Rather, it means reducing them to a level that encourages healthy and sustainable native vegetative communities.

This plan envisions Mount Jumbo grasslands in which native plants dominate, winter forage is abundantly available, and wildflower displays are vibrant and diverse. Although some weeds and undesirable exotic plants remain, the grassland communities are healthy enough to stave off most attacks. When weeds begin again to encroach, prompt spot treatment prevents grassland degradation.

Within this array of healthy grassland communities the plan further envisions site management to enhance specific features that make Mount Jumbo attractive. One site management example is described below.

Elk forage production.
As a goal, plan to assure adequate winter forage for 70 elk for a period of 90 days one year out of three. At 12# of forage/day and 60 percent utilization, 70 elk will use 75,600# of forage if 126,000# is available. Treatment of 250 acres to yield 500# per acre would assure that the risk of forage inadequacy is below the critical level.

Other examples include working toward weed-free trailheads and buffering viable native vegetation—see the Tools section later in this chapter.

D. Grasslands Management Strategies

The grasslands management strategy for Mount Jumbo was developed in the context of an overall strategic ecological framework. Many political and social concerns were considered during the planning process (see Planning Process Overview). The strategy described below is based primarily on our best understanding of ecology and its relationship to Mount Jumbo's plant communities; however, it addresses also many political and social concerns.

In addition to implementation of these strategies, the management plan's success will depend heavily upon a widespread education program. Education will provide the public with an awareness of the weed problem, lay out steps people can take to prevent weeds from spreading, and describe opportunities to participate in monitoring and restoration activities. Please refer to the Maintenance Chapter for a full description of the program.

1. A Strategic Ecological Framework

All plant communities are in constant flux. The mosaic of Mount Jumbo's plant communities is continually changing in response to a complex set of biotic and abiotic factors. Although scientists and other knowledgeable individuals do not completely understand these processes, the management strategies described below are based on the best knowledge to date.

Recent studies suggest that plant community change is largely dependent upon plant site (niche) availability, species availability, and species performance. In order to achieve desirable successional change, native species must be present in the plant community, and these species must perform at least as well as the competing undesirable species. Finally, niche sites must be available.

An overall framework for ecologically-based weed management will ensure that native plants occupy available niches as they appear, encouraging the maintenance and gradual restoration of native plant communities. Although the management

strategies proposed for Mount Jumbo are intended to facilitate this process, there are no quick fixes, and none can be expected.

The ecologically-based strategy described below will, in the long term, work toward achieving the management objectives previously described. Vegetation management actions will be evaluated based on how well they 1) effect niche availability for natives, 2) increase the availability of native species, and 3) improve the performance of these native plants.

2) Management Strategy Components

Within this ecological framework the Missoula Parks and Recreation Department will employ a comprehensive management strategy, including education, research, prevention, and management of larger areas of the mountain. These components are described below.

a) Education

Public education is an essential component of the *Mount Jumbo Management Plan*. The Education Chapter more fully describes the elements of the program, including education on noxious weeds. Demonstration plots, which will serve both research and education purposes, are described in the research section below. Other educational efforts could include public tours, signs, and weed pull demonstration areas at highly visible locations, such as trailheads.

b) Outreach to adjoining landowners

The Parks Department will contact adjoining major landowners to inform them about the City's management plan for Mount Jumbo. The land manager also will offer assistance to landowners in developing complementary vegetation management plans.

c) Prevention

Efforts to prevent the spread of noxious weed species constitute the second most important long-term strategy. Prevention will include active weed management along Mount Jumbo's boundaries, aggressive weed control along public travel corridors, and the maintenance and restoration of plant communities at trailheads, which could otherwise act as a distribution point for noxious weed seeds. The Parks Department will manage new infestations promptly, and will re-seed

disturbed sites as soon as possible. As noted above, the Parks Department will provide education to recreational users.

d) Early Treatment and Containment

New infestations and/or isolated patches of noxious weed species, such as St. John's wort and leafy spurge, will be treated aggressively to prevent further spread, root establishment, and seed production. An all-out effort on such populations has a high potential for successful elimination. Areas where noxious weeds are absent or minimal will be identified and surrounded with a buffer zone in which management treatment will minimize further invasion**.**

e) Research

Demonstration plots will serve two important purposes:

- to test the effectiveness of treatments that may be then applied to larger areas on Mount Jumbo, and
- to educate both land managers and the general public.

The Parks and Recreation Department will develop approximately 15 to 25 plots. Each will consist of three contiguous sub-plots of equal area, ranging in size from 50 feet by 50 feet to one acre, that enclose a similar plant community. One sub-plot will serve as a control (no treatments applied) while two will receive treatments, serving as replicates.

The demonstration plots will provide direct treatment of up to 50 acres. More importantly, they will test a variety of integrated pest management (IPM) techniques that are poorly understood and/or have not previously been used in combination.

Demonstration plot treatments will address two broad categories: a) treatments for areas without viable native plant communities (less than 30%) and b) treatments for areas containing viable native communities (more than 30%). Appendix D lists possible treatments by category.

Demonstration plot results are central to the grasslands management annual evaluation procedure.

f) Management of Larger Areas on the Mountain

Concurrently with installing demonstration plots, the Parks and Recreation Department will begin to maintain and restore native plant communities over larger areas of Mount Jumbo. Treatment of larger areas will be derived both from existing methods and, eventually, demonstration plot results. To be considered for use on Mount Jumbo, treatments must satisfy the management objectives set forth earlier.

Large area treatment will require careful site selection, examination of plant communities, and site-specific management goals. Appendix E presents treatment options for larger areas with and without viable native plant communities. Eventually, based on successful demonstration plot results, additional treatments will be implemented according to the evaluation procedure outlined on page 68.

Management will be tailored to specific vegetative and geographical zones of the mountain. Zones will be prioritized based on their location and condition as follows:

- Highest priority will be given to viable plant communities that are predicted to soon drop below 30 percent native species remaining.
- Areas bordering private lands on which complementary management practices are in place will receive high priority.
- Other high priorities include: trailheads; trail corridors; and areas with relatively few weeds in which the native plant community dominates.
- Lowest priority will be given to areas in which very aggressive weeds (for example, leafy spurge and Dalmatian toadflax) represent more than 80 percent of the existing vegetation.

3) Tools

The Missoula Parks and Recreation Department will employ various weed control techniques both in demonstration plots and over larger areas of the mountain. The specific tools will be chosen as part of an integrated pest management (IPM) approach. IPM is a federal policy developed by the Council on Environmental Quality (CEQ) in 1979. CEQ defines IPM as:

> …the selection, integration, and implementation of pest control based on predicated economic, ecological, and sociological consequences. IPM seeks maximum use of naturally occurring pest controls including weather, disease agents, predators, and parasites. In addition, IPM utilizes various biological, physical, and synthetic herbicide controls and habitat modification techniques. These controls are imposed only as required to keep a pest from surpassing

intolerable population levels predetermined from accurate assessments of the pest damage potential and the ecological, sociological, and economic costs of the control measures.

Appendix A lists the steps recommended in an IPM program (these will be tailored to Mount Jumbo). Appendix B lists four IPM components, their predicted effectiveness, and associated costs.

Because existing research demonstrates that no single tool can effectively restore a native plant community, IPM is an extremely important strategy. However, treatment combinations must be chosen carefully, based on either prior research or ecologically based "best guesses." Any of these techniques has the potential to impact various aspects of the ecosystem.

Described below are various techniques that may be used on Mount Jumbo. Biological controls, re-seeding, mulches, and hand pulling will be applied aggressively whenever possible. Mowing and burning must be used with caution and are subject to the limitations specified. Grazing and herbicides are a focus of public concerns and have the potential to affect the public. Various alternatives are given for the application of these two tools.

a) Biological Controls

There are about 20 types of insects and fungi that attack noxious weeds of the type found on Mount Jumbo. Appendix C lists biological controls that have either already been released near Mount Jumbo or are suitable for release. Most are available at little to no cost through the Missoula County Weed Control District.

Biological controls alone will not reduce existing weed populations to desirable levels. However, these agents reduce the vigor of weed species. In doing so, they improve the ability of native species to maintain and reestablish niche sites. The Parks Department will make every attempt to ensure that all appropriate known biological controls are released on Mount Jumbo.

b) Re-seeding

Re-seeding can reduce the susceptibility of bare soil to weed infestation. Bare soil is often left after natural or man-made disturbances, including the removal of existing plants by hand-pulling, fire, grazing, or synthetic herbicides. Seeds can be sown by broadcasting on the soil's surface or by mechanical drilling.

Areas re-seeded promptly after undesirable plants are removed will get a head start on naturally produced weeds and will be resistant to new weed encroachments. Timing and weather are important, however, and there is a risk of complete failure.

The Parks Department will re-seed with native grass seed where appropriate, with emphasis on: 1. Non-viable plant communities, and 2. Areas disturbed by such activities as hand-pulling, mowing, trail maintenance and trailhead construction, etc.

c) Mowing

Mowing can control some weed species, and may enhance the growth and vigor of native plants if done when they are not flowering. The effects of mowing are similar to grazing, especially if it is timed to remove flowers before they go to seed. If mowing is done with a string trimmer it can be highly selective and has very few terrain limitations. Mowing is, however, labor intensive and very expensive. Moreover, most of the weeds on Mount Jumbo have an ability to adapt to mowing (knapweed, sulfur cinquefoil, cheatgrass), or an ability to propagate by horizontal root systems (leafy spurge, Dalmatian toadflax.) Other than by string trimmer, mowing will be impossible on much of the mountain due to terrain limitations.

A limited number of acres on Mount Jumbo will be mowed. Mowing will generally be limited to trailheads, trails, and, in some instances, the property perimeter.

d) Burning

Burning is similar to mowing, but has the advantage of being usable on almost any terrain. Native species evolved under occasional burning and may benefit from periodic fire, but the weed control possibilities and limitations of mowing also apply to burning. Caution must be used to prevent loss of control.

Fire can be extremely effective as an initial treatment in an IPM program when the initial objective is to remove the overhead “rough” to allow follow-up grazing treatment. Burning will suppress annual bromes; however, it can promote the spread of knapweed. Burning should be tied to a re-seeding program.

e) Mulches

Mulches such as straw, leaves, woodchips, sawdust, etc. may be used in demonstration plots and in other small areas, such as trailheads.

f) Hand Pulling

Hand pulling is useful for smaller infestations. However, hand pulling disturbs the soil, allowing undesirable species to re-occupy the site. The Parks Department will re-seed larger areas subjected to hand-pulling.

The main trailheads on Mount Jumbo are characterized by heavy infestations of knapweed and little native flora. Hand-pulling may be especially useful at these trailheads, which pose a higher than normal threat to the success of any weed control program because they are a major seed source at a transportation hub. The Parks Department will implement a volunteer weed-pulling program targeting trailheads and trail corridors, training volunteers in weed identification and re-seeding techniques. The program will contribute to public awareness and represents an important part of the public education program.

The Parks Department will employ two additional tools: grazing and synthetic herbicides. Management alternatives are given below for these tools, which are a focus of public concern and have the potential to affect the public.

g) Grazing

Grazing sheep and goats is successful in controlling both knapweed and leafy spurge. Grazing should occur when target weed species are most vulnerable and managed so that grasses do not become an important component of the sheep diet. Grazing also must be timed to work in conjunction with biological controls already present. Grazing will affect recreation to the extent that dogs must be leashed while the sheep herd is present.

The costs and benefits of several grazing alternatives are summarized in Table A. Because many parts of Mount Jumbo could be grazed, and because grazing is likely to receive considerable public attention and scrutiny, this management plan presents the following spectrum of grazing alternatives.

Alternative One: 50 sheep, 30 days of grazing.

A herd of fifty sheep would be grazed on demonstration plots. Consuming approximately three pounds of forage per animal per day, the herd could effectively treat between ten and thirty acres. The owner would lend the herd at no cost, and a contract herder would cost about $2,500.

Advantages: The herd is small, locally owned, and could be taken back to private land at night. Treatments could be easily controlled and supplying water to the herd would pose no logistic problems.

Disadvantages: A herd of this size could be used only for demonstration plots and research purposes.

Alternative Two: 200 sheep, 30 days of grazing.

This alternative assumes it would be possible to "rent" sheep for treatment of approximately 100 acres. Cost would be $6,000 to $7,000 for a herder.

Advantages: This alternative's moderate scale would hold potential problems to manageable proportions. Treatments would be easily controlled and the logistics problems, should they prove greater than expected, would not overwhelm the program.

Disadvantages: The treatment area would be relatively small in relation to the area that may eventually require treatment.

Alternative Three: 500 sheep, 30 days of grazing.

This alternative assumes it would be possible to "rent" 500 sheep for 30 days. Treatment of approximately 250 acres is estimated. The cost includes both a herder and the logistics of handling and moving the herd. One possible solution might be to buy the sheep and sell them at the end of the grazing period. The estimated cost is $8,500 to $11,000.

Advantages: A fairly large area could be effectively treated, and there is no long-term commitment should grazing prove ineffective.

Disadvantages: A herd this size could not be returned at night to a local corral. Water hauling would be necessary and more than one bed ground

would be required. Sheep dogs or llamas, used to manage the sheep, may attack domestic dogs. A herd this size could cause considerable damage through soil erosion and reduction of native plants.

Alternative Four (proposed by a local herdsman): 500 ewe-lamb pairs, 180 days of grazing. The herd would be reduced by half when the lambs are sold in July. Two dogs, two llamas, and a semi-permanent sheep camp would be required. Estimated cost is $15,000.

Advantages: The herdsman would assume the risk, and a herd this size likely could reach all areas needing treatment.

Disadvantages: In order to assure a profit, the herdsman has requested a six-month grazing season and a seven-year contract. Predator control may be essential during the two months in which half the herd consists of lambs. Water hauling and more than one bed ground would be required. Sheep dogs and llamas might attack domestic dogs. A herd this size could cause a great deal of erosion and it presents a higher risk than alternative three to non-target plants.

h) Synthetic Herbicides

Rangeland managers often use synthetic herbicides to control noxious weeds because herbicides are quick-acting and can be applied easily on virtually any terrain. However, every herbicide is dangerous. Serious health and environmental damage may occur whenever herbicides are applied. Herbicides must be reapplied periodically to achieve effective weed control, particularly when used alone.

Of all the proposed tools, herbicides have engendered the greatest public comment and concern; both pro and con arguments have been made with equal conviction. If used, synthetic herbicides will be applied no more than necessary to achieve vegetation goals, and helicopter application will not be used unless recommended in the annual evaluation procedures in paragraph 7. In recognition of divided public and agency sentiment, this chapter offers one non-herbicide alternative and three alternatives for herbicide use within the IPM management strategy. Table B summarized the costs and benefits of each alternative.

Alternative One: No Synthetic Herbicides

Advantages: No impact of herbicides on native forbs and no risk of human exposure to synthetic herbicides.

Disadvantages: Not as immediately effective as other alternatives in reducing weed populations and maintaining grass species that provide winter forage for wildlife. Native forbs would be lost if other treatments are not effective in reducing weeds.

Alternative Two: Application of synthetic herbicides will be confined to Demonstration Plots until results have been evaluated.

An IPM strategy assumes that no single tool can be as effective as several tools used in concert. The Demonstration Plots include trials in which control and maintenance of noxious weeds combines herbicides with other tools in ways that have not been previously reported (see Appendix D).

Advantages: Would test the effects of synthetic herbicides in combination with other concurrent treatments on potentially sensitive plant communities. If test results are favorable, new treatment strategies could be developed that utilize herbicides on larger areas. Meanwhile, synthetic herbicide use would be restricted to easily located, marked, and posted areas.

Disadvantages: Useful for research and demonstration purposes only.

Alternative Three: Synthetic herbicides would be applied by hand within Demonstration Plots and over larger areas. In addition to herbicide use in Demonstration Plots, a maximum of 100 acres per year outside the demonstration plots could receive treatment..

Advantages: Would allow immediate treatment of noxious weeds in high priority areas, providing short-term suppression of knapweed infestations within viable native plant communities.

Disadvantages: Within treated areas, possible diversity reduction among native broad-leafed plants. Would present a higher risk of synthetic herbicide exposure to humans, wildlife, and domestic animals. Even in small quantities, herbicide application may seriously harm some individuals, particularly those who are chemically sensitive. Repeated applications would be required to maintain initial results.

Alternative Four: Synthetic herbicides would be applied by hand both within demonstration plots and over targeted acreage outside the plots. Outside demonstration plots only the most selective herbicides would be used and the target weeds and area to be treated would be precisely specified. A maximum of 200 acres a year would be treated.

Advantages: Would allow immediate treatment of noxious weeds in high priority areas, providing short-term suppression of knapweed infestations within viable native plant communities over larger areas than Alternative Three.

Disadvantages: Within treated areas, possible diversity reduction among native broad-leaf plants. Compared to other alternatives, would present a higher risk of synthetic herbicides exposure to humans, wildlife, and domestic animals. Even in small quantities, herbicide application may seriously harm some individuals, particularly those who are chemically sensitive. Repeated applications would be required to maintain initial results.

4. Individual Tools versus Combination Treatments

As stated previously, no single tool will suppress noxious weeds on Mount Jumbo. The examples listed below summarize the results that can be expected from various management tools when implemented individually on two noxious weeds, leafy spurge and knapweed.

a) Leafy Spurge

Herbicide - on established stands, one quart of Tordon per acre will reduce leafy spurge plant density by 65 percent the first year, whereas, a 90 percent reduction requires another two consecutive years of herbicide application. It takes several years for leafy spurge to develop its extensive root system. Applying an herbicide during these years can achieve 90% control with one application of herbicide.

Grazing - sheep or goat grazing will reduce stand density 40 to 80 percent.

Biological - insects that attack the roots of leafy spurge have been the most effective. The flea beetles will reduce leafy spurge stands 30 to 85 percent where flea beetle populations are established. Currently, biological

controls are impacting 5 percent of the leafy spurge stands. It is expected over the next 25 years that biological agents will control 50 to 65 percent of the leafy spurge infestations.

Re-seeding - depending on the site, revegetation is essential when the desirable vegetation makes up less than 15 to 30 percent of the plant community. Plants that have evolved with leafy spurge, such as pubescent wheatgrass and crested wheatgrass, have been shown to be competitive. Our native plants tend to be less competitive. Restoring the native plant community will require more study, higher expenditure of resources and different combinations of the tools.

Research has shown that combining the above tools can increase their effectiveness. For example:

- A combination of flea beetle and fall-applied herbicides produce greater than 90 percent reduction in leafy spurge density.

- Spring grazing with goats followed by fall-applied herbicide produced greater than 90 percent control.

- The combination of sheep grazing and biological control using flea beetles reduced leafy spurge stands an additional 10 to 15 percent more than either method used alone.

In practical applications, the best results might be achieved by implementing treated buffer strips to keep the leafy spurge from spreading, together with re-seeding where needed, and selecting a combination of biological agents, grazing, and herbicides for larger leafy spurge infestations.

b) Knapweed

Spotted knapweed produces a much smaller root system and less foliage than leafy spurge. The strength of knapweed is its ability to build up a seed bank and its aggressive seedling stage.

Herbicides - depending on the product used, synthetic herbicides can provide 100 percent control of the parent plants for 1 to 4 years. Unless there is good plant competition, knapweed will come back from seed, requiring cyclical use of herbicide.

Grazing - sheep and goat grazing will suppress the knapweed plants and greatly reduce seed production. There is evidence that grazing has more of an impact on the younger plants than on well-established knapweed plants.

Biological - the biological controls released so far attack the seed head or the roots. Seed production is reduced about 50 percent. Root-feeding insects have more impact in the presence of root pathogens. While the biological controls reduce seed production and shorten the life of knapweed plants, there is no significant reduction of knapweed plant density.

Re-seeding - spotted knapweed is very effective at out-competing the native vegetation. The threshold for re-seeding is not well defined, but is generally recommended when the desired vegetation makes up less than 30 percent of the plant community. Introduced plants such as bromegrass, pubescent wheatgrass and others have been found to be competitive with knapweed. One suggestion for restoring native vegetation is to create islands of native plants and expand on them.

There are numerous studies being conducted on spotted knapweed that will provide more specific recommendations. Some combinations that show promise include:

- using herbicides to take out parent plants and following up with sheep grazing to take out the seedlings.

- using residual herbicides in the fall plus dormant seeding of native vegetation.

Currently, depending on the vegetative understory, the best results might be achieved by using combinations of herbicides and re-seeding, plus biological controls and grazing.

5. Possible Herbicide/Grazing Combinations for Mount Jumbo

There are 16 possible pairs of the grazing and herbicide alternatives previously described. Some of pairings, however, are impractical. Following are six combination examples feasible for Mount Jumbo. The first two are appropriate primarily for demonstration plots.

Combination Alternative A (primarily for demonstration plots)
Grazing One (50 sheep, 30 days grazing), Herbicide One (no synthetic herbicides) Initial treatment would be limited to a series of demonstration plots.

Justification: Because the complexity of weed populations and the proximity of residences make both grazing and herbicides controversial, initial grazing should be limited to a series of research plots and herbicides should not be used.

Review: Provides an excellent opportunity to expand the public's awareness of noxious weed problems, while at the same time treating some of the more distressed areas of the mountain. However, annual grazing would require vigilance to avoid overuse of native vegetation.

Combination Alternative B (primarily for demonstration plots)
Grazing One (50 sheep, 30 days grazing), Herbicide Two (synthetic herbicides confined to demonstration plots)

Justification: Because the complexity of weed populations and the proximity of residences make both grazing and herbicides controversial, initial application of these treatments should be limited to a series of research plots.

Review: Provides an excellent opportunity to expand the public's awareness of noxious weed problems, while at the same time treating some of the more distressed areas of the mountain with grazing and herbicides. However, annual grazing would require vigilance to avoid overuse of native vegetation.

Combination Alternative C
Grazing Two (200 sheep, 30 days grazing), Herbicide Two (synthetic herbicides confined to demonstration plots)

Justification: By combining moderate levels of grazing with herbicide application, the need to reapply herbicides could be minimized.

Review: There may be an immediate reduction in weeds, thus promoting native plant communities. Elk forage may be protected. Native wildflowers may be adversely impacted by treatment. The combined use of synthetic herbicides and grazing may be offensive to many people, including adjacent landowners and recreationists. Grazing this number of sheep would require vigilance to avoid overgrazing of native vegetation. Failure of vigilance could aggravate weed problems.

Combination Alternative D
Grazing Two (200 sheep, 30 days grazing), Herbicide Three (synthetic herbicides applied within demonstration plots and over larger areas)

Justification: By combining moderate levels of grazing with herbicide application, the need to reapply herbicides could be minimized.

Review: There would be an immediate reduction in weeds. Elk forage would be protected. While native wildflowers may be adversely impacted, the negative effects probably would be less severe than those from any other alternative. However, the combined use of synthetic herbicides and grazing may offend many people, including adjacent landowners and recreationists. Using this number of sheep would require vigilance to avoid overgrazing of native vegetation.

Combination Alternative E
Grazing Three (500 sheep, 30 days grazing), Herbicide One (no synthetic herbicides)

Justification: Give the proximity of residences and because recreationists use the area much of the year, synthetic herbicides have no place on the mountain. Treatment should focus on grazing and other non-chemical tools.

Review: Requires a permanent commitment to graze high numbers of sheep in perpetuity. Long term response in terms of reduced weeds, enhanced elk forage, and improved forb cover could be positive. However, grazing large numbers of sheep could offend some users. It also would require great care to avoid overgrazing of native vegetation and an increase in weeds.

Combination Alternative F
Grazing Three (500 sheep, 30 days grazing), Herbicide Two (synthetic herbicides confined to demonstration plots)

Justification: Mount Jumbo is a unique site because of its recreational uses. By pressing ahead with grazing while confining herbicide application to demonstration plots, potential conflicts could be better evaluated and minimized.

Review: Would provide an opportunity to expand the public's awareness of noxious weed problems while treating some of the more distressed areas of the mountain. A permanent commitment to graze high numbers of sheep is implied

only if the herbicide/grazing demonstration plots fail. However, grazing large numbers of sheep could offend some users. It also would require great care to avoid overgrazing of native vegetation and an increase in weeds.

6. Recommendation

The Stewardship Subcommittee recommends the immediate implementation of a comprehensive management strategy, including education, research, prevention, and management of larger areas of the mountain (see pages 53 to 55 for details).

With regards to treatments used both in demonstration plots and over larger areas of the mountain, a sequential management approach will provide the opportunity for testing, for problem solving, and for modifications to incorporate treatment combinations after local tests have been completed. The sequence would immediately incorporate aggressive use of biological controls, which are considered highly effective and low-risk. Treatments that have the potential for greater risk, such as burning and mowing, would be employed with greater caution. Treatments that have the greatest potential for harm, including grazing and synthetic herbicides, would be applied in small measure initially and the results monitored closely.

Following at least one year using Combination Alternative B and based on the experience gained, the recommended vegetation management sequence could modify either the grazing or herbicide treatment, or both. All selected changes should move toward greater weed suppression, and changes should be based on successful demonstration and public involvement. Potential combinations might include Grazing One paired with Herbicide Three and Grazing Two with Herbicide Three.

Following at least one year using the selected alternative, the vegetation management sequence could again change either grazing, herbicides, or both. Potential combinations at this third step might include Grazing Two, Herbicide Two; Grazing Two, Herbicide Three; Grazing Three, Herbicide Two; and Grazing Three, Herbicide Three.

7. Annual Evaluation Procedure

The Vegetation Subcommittee of the Stewardship Advisory Committee will evaluate the management strategy annually as follows. The Subcommittee will review monitoring data, demonstration plot status, and large area treatment results each fall. The Subcommittee will form a recommendation on whether to proceed with the current treatment or to change the treatment. At that point, the Subcommittee will present its findings to the Stewardship Committee. The Stewardship Committee will report to the Parks and Recreation Board, who will discuss and evaluate the findings, and make a recommendation to City Council as to whether a new strategy should be adopted. The Council will have until March 1st to adopt the new strategy; otherwise the Parks Board's recommendation stands.

8. Agency Coordination

Coordination will be sought with other local, state, and federal agencies to carry out the components of this plan. This cooperation will include but not be limited to the cooperative use of equipment, personnel, and other resources to help in carrying out the management objectives of this plan.

Table A:
Some Predicted Costs and Benefits of Grazing Alternatives

ALTERNATIVE	FORAGE FOR WINTERING ELK	HUMAN HEALTH	RECREATION	ESTIMATED COST	
Alternative One: 50 sheep, 30 days	No effect	No effect	Dogs required to be on leash in proximity of sheep herd	$2,300 to $3,000 (sheep provided at no cost by neighboring landowner)	So for der
Alternative Two: 200 sheep, 30 days	Eventual increase in forage	Low risk	At higher grazing levels, ground nests of birds could be destroyed	$4,300 to $6,000	So tar wit der
Alternative Three: 500 sheep, 30 days	Potential increase in forage with careful herding	Possible risk of irritation from dust and noise	Potential for conflict among herding dogs, llamas, and domestic dogs (including those on leashes)	$7,500 to $9,000	Te for bec wit her
Alternative Four: 500 sheep, 180 days (self-sustaining operation)	Probable forage loss	Higher risk of irritation from dust and noise	Increased potential for conflict among herding dogs, llamas, & domestic dogs (including those on leashes)	$15,000	Re los pos

Table B:
Some Predicted Costs and Benefits of Herbicide Alternati

ALTERNATIVE	FORAGE FOR WINTERING ELK	HUMAN HEALTH	RECREATION	COST/ ACRE	
Alternative One: No synthetic herbicides used	No increase in forage	No risk of exposure to synthetic herbicides	No impact	$0	
Alternative Two: Synthetic herbicides (restricted to six or fewer demonstration plots—hand sprayed)	Temporary increase within demonstration plots on which herbicides are used	Low risk of exposure to synthetic herbicides	Temporary closures near test plots with synthetic herbicide applications	**Demonstration plots**: $225 per acre up to 12 acres per year	So tar wit de
Alternative Three: Synthetic herbicides used on up to six demonstration plots and on up to 100 acres per year outside demonstration plots (hand sprayed)	Temporary (2 to 3 year) increase over larger treatment areas	Higher risk of exposure to synthetic herbicides	Temporary closures on significant portions of the mountain		Sa Alt lar
Alternative Four:	Same as Alternative Three except 200 acres per year could be treated, with sub				

V. Forests

A. Historic Condition

Fire has shaped Mount Jumbo's forests and grasslands for thousands of years. Many plants evolved to endure repeated fire using a variety of strategies to either resist mortality or regenerate from seed or sprouts. Ponderosa pine, for example, has extremely fire resistant bark, allowing it to survive fires that destroy species such as Douglas fir.

Studies of fire history in nearby areas suggest that low intensity surface fires probably occurred over most of Mount Jumbo at intervals varying from 5 to 20 years during the past several centuries. This would have created a plant community mosaic primarily of grass and grassland-pine savanna.

Humans began to suppress fire on Mount Jumbo beginning about 1900. Fire suppression encouraged the expansion of ponderosa pine and Douglas fir, threatening forest health and increasing the chances of a stand-destroying fire that would eliminate trees of all ages.

B. Present Condition

Volunteers have identified and mapped existing communities of the following types: grasslands, savanna (grasslands with scattered trees), young dense forest, young open forest, mature closed canopy forest, mature open forest, shrub patches and thickets. These features are shown in Map A.

The greatest timberland challenge on Mount Jumbo is the expansion and thickening of forest cover. Fire hazard has increased in some locations due to accumulation of live and dead fuel near the ground. In those areas, risk of a stand-destroying fire is high. A wildfire could eliminate trees of all ages. This would greatly reduce wildlife hiding cover as well as older trees with aesthetic and wildlife value.

C. Desired Condition

This plan envisions forests on Mount Jumbo that are fire-resistant, park-like, open stands. The forest will include trees of various ages and have an understory of grasses, wildflowers, and shrubs. Islands of dense timber will provide hiding cover for wildlife. Thinning and reduction of hazardous fuels will encourage and protect old growth forest that contains dead trees and snags important to many species of birds and other wildlife.

D. Forest Management Strategies

1. Fire Management

Fire management entails both protection from wildfire and application of prescribed fire to meet the goals of the *Mount Jumbo Management Plan.*

Wildfire Management: The State of Montana has responsibility for prevention and suppression of wildfires on Mount Jumbo. The policy applying to Mount Jumbo and surrounding areas is to prevent and suppress all wildfires that start either from human acts or natural causes such as lightening. During periods of extreme fire danger, Mount Jumbo may be closed to the public. Necessity for a fire closure would be determined by the State of Montana following its standard process for initiating fire closures.

Although fire is a natural process, wildfires must be suppressed on Mount Jumbo to prevent loss of desirable forest cover and threats to people and adjacent property. But undesirable consequences of increased fire hazard, including the unwanted encroachment of conifers, must also be recognized and mitigated. The City Fire Department Pre-Plan for wildfires on Mount Jumbo is under revision. Once completed, it will be available from the City of Missoula Fire Department and Parks and Recreation Department.

Prescribed Fire Management: Properly applied, prescribed fire can be a practical and effective means of reducing hazard and achieving desirable vegetation. Successful application of prescribed fire must acceptably address three important concerns:

1. Safety from escaped fire
2. Smoke impacts on air quality, and
3. Acceptance by the public and neighboring landowners.

To address these concerns, the following steps will be taken:

1. The Missoula Parks Department and citizen and agency volunteers will provide public education on prescribed fire,

2. Public review by adjacent landowners and concerns citizens will be sought.

3. Fire professionals will prepare specific burning plans. Plans will specify the exact location of burning, conditions under which burning can proceed, and the measures taken to contain fires within designated boundaries.

4. The Lolo National Forest and State of Montana fire managers will participate in planning, approve proposed burning plans, and conduct the burning operations to the extent reasonable and possible.

5. Plans will be approved by the Missoula County Fire Protection Association, comprised of City of Missoula, East Missoula, State, and Federal fire control representatives.

6. Burning will be carried out only on days approved by the appropriate Missoula County or State of Montana air quality regulators.

2. Forest Health Strategy

Public comment on forest management alternatives contained in the *Vegetation* preliminary draft clearly supported forest diversity. The management strategy to accomplish this goal incorporates various techniques, including thinning and prescribed fire, in ten to twenty year disturbance cycles. Comments on tree removal strategies were sparse and inconclusive; therefore this revised draft incorporates the strategy of cutting and pile burning, which was recommended by agency staff and volunteer botanists and biologists.

Four vegetation zones (Map B) are delineated, based on differences in vegetation type, vegetation condition, and management challenges. The zones and goals for each are:

Zone 1 (South Half Forest)
* Maintain elk hiding cover
* Encourage and protect overstory trees
* Reduce fire hazard by removing surface and ladder fuels
* Maintain existing grass/forb communities

Zone 2 (Savanna)
* Maintain open forest condition, i.e. mostly grasslands with scattered trees and tree patches
* Restore native grasses and forbs where possible

Zone 3 (NW Closed Forest)
* Maintain a fully stocked, uneven-aged forest
* Encourage old growth trees
* Reduce fire hazard by removing surface and ladder fuels

Zone 4 (NE Open Forest)
* Maintain open forests of old growth trees
* Restore and maintain a healthy and diverse cover of shrubs, grasses, and forbs in the understory
* Maintain low fire hazard
* Encourage development of wildlife snags

The Parks Department will employ various methods of vegetation management, primarily thinning and prescribed fire, to meet vegetation goals. A disturbance cycle of 10 to 20 years will be employed. This means that some action will occur within each area needing treatment every 10 to 20 years. Forest management activities will be initiated over 10 to 12 consecutive years so that only a small portion of Mount Jumbo will be treated in any one year. Areas such as the southern end of Mount Jumbo may not require disturbance treatments. No new roads will be built except in case of emergency.

Over time, the vegetation within each zone will change, providing a moving landscape mosaic. Treatments and results will be evaluated after the initial rotation is completed as an ongoing process to determine whether vegetation goals are being met. Initial treatments will serve as demonstrations for managers and the public to evaluate treatment results.

APPENDIX A

Steps for Implementing an Integrated Pest Management (IPM) Strategy

1. *Establish goals*: What is the use of the land? What is the desired vegetation?
2. *Initial information gathering*—Identify weeds, map their location, and gather information about previous weed management activities. Coordinate with adjacent landowners. (Some of this work has been completed as part of the baseline study.)
3. *Monitoring*—Assess the site for characteristics, problems and strengths, observing vegetation cycles, growth patterns, infestations, etc.
4. *Setting threshold levels*—Differentiate between the mere presence of noxious weeds and infestations severe enough to cause significant damage.
5. *Setting action levels*—Prioritize target species and determine when to intercede so that undesirable injury is avoided. Emphasize continued early control of new invaders.
6. *Select treatments*—Select effective action that addresses the cause of the weed occupancy, least disrupts the environment, and poses the least threat to human health. This may involve combining several treatment methods. Determine if the chosen treatments will move the plant community toward the desired vegetation.
7. *Public notification*—Notify the media prior to any spraying, burning or other sensitive treatment activity. The Parks Department will post signs in all areas treated with intensive control activities. Signs will describe what is being controlled, the action taken, and provide an agency contact number.
8. *Prevention*—is the most important and most cost effective part of weed control and vegetation management. Prevention includes limiting soil disturbance, re-seeding disturbed sites, and properly managing desirable vegetation. Prevention also includes educating users on how they can help minimize the spread of weeds.
9. *Future Strategies*—Incorporate new strategies as new technology becomes available.

APPENDIX B

Four IPM Components, Predicted Control, and Costs

Biological Control

Cost: free if working with County to supply biologic agents

Leafy spurge: 30-85% control
Dalmatian toadflax: no control; some seed reduction
Knapweed: 50% seed reduction; a few sites showing visible impact
Sulfur cinquefoil: no control

Grazing

Cost: depends upon management arrangement; assuming that the sheep are available at little to no cost, approximately $2,500 per month herding cost

Leafy spurge: stand density reduction of 40 to 80%
Dalmatian toadflax: some seed reduction
Knapweed: seeds managed 50 to 90%; foliage suppressed
Sulfur cinquefoil: some seed reduction

Re-vegetation

Areas should be re-vegetated when undesirable vegetation makes up 70 to 85% of the plant community.

Cost: prices for native seed range from $10 to $200 per pound and the seeding rate varies from 15 to 60 pounds per acre.

Herbicides

Reducing weeds through herbicide application depends on timing, rate, stage of plant growth, and plant susceptibility. When selecting an herbicide, the impact on native plants must also be considered. In addition, considerations include toxicity and potential ground water contamination.

Cost: depends on method of application, rate, acreage, and cost of the herbicide selected. Costs currently vary from $20 up to $225 per acre.

APPENDIX C:

Biological Weed Control Agents in Missoula County

SPOTTED KNAPWEED			
Urophora affinis	Fly	Attacks Seed Head	Well established.
Urophora quadrifasciata	Fly	Attacks Seed Head	Well established.
Metzneria paucipunctella	Fly	Attacks Seed Head	Not established as it does not winter well in Montana.
Agapeta zoegana	Moth	Attacks Roots	Established in small numbers.
Cyphocleonus achates	Weevil	Attacks Roots	Established in small numbers.
Larinus obtusus	Weevil	Attacks Seed Head	Released but establishment not confirmed.
Sclerotinia sclerotiorum	Fungus	Attacks Crown	Native fungus that occurs naturally and causes plant mortality.
LEAFY SPURGE			
Aphthona cyparissiae	Flea beetle	Attacks Roots-Leaves	Established in small numbers.
Aphthona flava	Flea beetle	Attacks Roots-Leaves	Established in small numbers.
Aphthona lacertosa	Flea beetle	Attacks Roots-Leaves	Released but establishment not confirmed.
Aphthona nigriscutis	Flea beetle	Attacks Roots-Leaves	Well established.
Oberea	Beetle	Attacks Stems-	Released but establishment not

erythrocephala		Roots	confirmed.
Hyles euphorbiae	Moth	Attacks Leaves	Well established.
Spurgia esulae	Fly	Attacks Seed Head	Released but establishment not confirmed.

YELLOW AND DALMATIAN TOADFLAX			
Calophasia lunula	Moth	Attacks Leaves	Established in Missoula County with releases made at a number of sites.
Brachypterolus pulicarius	Beetle	Attacks Seed Head	Established in Missoula County.
ST. JOHNSWORT			
Aplocera plagiata	Moth	Attacks Leaves-Flowers	Released but establishment not confirmed.
Chrysolina hyperici	Beetle	Attacks Leaves-Flowers	Established in Missoula County.
Chrysolina quadrigemina	Beetle	Attacks Leaves-Flowers	Established in Missoula County.
CANADA THISTLE			
Ceutorhynchus litura	Weevil	Attacks Leaves	Established in small numbers.
Rhinocyllus conicus	Weevil	Attacks Seed Head	Established in Missoula County.
SULFUR CINQUEFOIL			
Tinthia Myrmosaeformis	Moth	Attacks Roots	Currently in screening process.
Anthonomus rubripes	Weevil	Attacks Flowers	Currently in screening process.

APPENDIX D

Treatment Options for Demonstration Plots

A. Treatments for areas with a viable native plant community

- Hand pulling (2x/year - summer and fall)
  treatment combinations:
  hand pulling only
  hand pulling + seeding disturbed soils

- Grazing (important considerations include timing (phenology), duration, and density)
  treatment combinations:
  graze for seedlings (spring) only
  graze for seedlings + hand pull to remove adults
  graze for seedlings + hand pull + graze bolting plants (summer)

- Clipping with a 'selective disc' weed eater
  treatment combinations:
  clip 3x/year -bud stage/summer/fall

- Burning
  treatment combinations:
  repeated spring (March) burns (3 years/row)

- Herbicides
  treatment combinations:
  Transline (pint/acre) + spring grazing the following year
  Tordon (1/2 to 1 pint/acre) in areas at extreme risk of losing native component
  Finale (?pint/acre) on selected species

B. Treatments for areas without a viable native plant community

- Burning + Seeding in fall @ low rate (15 lb./acre)
  Burning + Seeding in fall @ high rate (30 lb./acre)
- Tordon (1/2 to 1 pint/acre) + Seeding in fall @ low rate
  Tordon (1/2 to 1 pint/acre) + Seeding in fall @ high rate
- Grazing at high density and duration + Seeding in fall @ low rate
- Grazing at high density and duration + Seeding in fall @ high rate

APPENDIX E

Treatment Options for Larger Areas on the Mountain

A. Treatments for areas with a viable native plant community

Prioritizing areas with new non-native plant encroachments that are small enough in area, and low enough in density, to most likely be successfully be controlled. Also prioritizing native plant communities on the threshold of being lost to increasing non-native populations.

herbicides @ low volumes in at risk plant communities:

- Transline + grazing (see details above)

biocontrols should be obtained and released liberally in all priority regions in areas of concentrated or limited extent non-native encroachments:

- Hand pulling
- grazing
- herbicides

B. Treatments for areas without a viable native plant community

Prioritizing trailheads and areas that have the most likelihood of spreading to native communities.

- "Island Strategy"- restore ~1 acre areas that are evenly distributed throughout a given non-viable area. Restoration of these islands would be accomplished through techniques similar to those listed in Appendix D, section B. Continue to apply other weed control methods to the broader area. This strategy attempts to establish islands of native plant communities that can act as a seed source and native refugia which may expand and recover non-viable areas over time.

- strips - same as above, but restore carefully spaced strips
- trailhead revegetation with burning + seeding

APPENDIX F: Sheep Grazing Costs

EWES WITH LAMBS		CULL EWES (EWES WITH C
Expenses:		Expenses:
Purchase 500 Ewes (female sheep) @ $100 ea.	$ 50,000	Purchase 500 Cull Ewes @ $50 ea
Fencing for Holding Acres, Water troughs, shipping costs	3,500	Fencing for Holding Acres, Water shipping costs
Herder Costs	2,500	Herder Costs
TOTAL	56,000	TOTAL
Income:		Income:
Sale of 450 ewes @ 100 (10% casualty loss)	45,000	Sale of 450 ewes @ 100 (10% cas
NET COST	11,000	NET COST

COST TO GRAZE 200 SHEEP FOR 30 DAYS		
Expenses:		Expenses:
Purchase 200 Ewes @ $100 ea	$ 20,000	Purchase 200 Cull Ewes @ $50 ea
Fencing for Holding Acres, Water troughs, shipping costs	2,500	Fencing for Holding Acres, Water shipping costs
Herder Costs	2,500	Herder Costs
TOTAL	25,000	TOTAL
Income:		Income:

Sale of 180 ewes @ 100 (10% casualty loss)	18,000	Sale of 180 ewes @ 100 (10% cas
NET COST	7,000	NET C

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Mount Jumbo Management Plan Chapter Six

–Elk Winter Range–

Adopted by City Council on June 23, 1997

This section addresses the winter and early spring requirements of elk on the urban fringe, while providing maximum compatible access to public lands.

Much of the information below was provided by the Montana Department of Fish, Wildlife & Parks and the Lolo National Forest, partners in the Mount Jumbo Project.

Introduction

The presence of 50-100 elk on Mount Jumbo each winter and early spring poses unusual opportunities and challenges for Missoula citizens, particularly now that the mountain has passed from private to predominately public ownership.

With its acquisition of Mount Jumbo land, the Missoula community has assumed partial responsibility for this highly visible elk herd. Security from excessive human disturbance was an important attribute of the elk winter range on Mount Jumbo when most human access was prohibited by private landowners. Without awareness and planning under public ownership, increased human activity on the mountain during the critical winter and early spring months likely would have caused this elk herd to abandon its winter perch above Missoula's central business district.

Clearly, potential conflicts between winter-spring public use and wintering elk require special and focused management consideration. No other management issue is likely to warrant the regularly scheduled closure of City property on the mountain. It is assumed that the broadest public interest are served by a management solution that allows as much public use of city property as possible

and practical, without unduly risking the continued presence and survival of elk on Mount Jumbo during winter and early spring.

Relation to Management Objectives

The Elk Winter Range section of the *Mount Jumbo Management Plan* addresses Objective 1 (i.e., "protect and enhance natural values . ."), Objective 3 (i.e., "maintain space and other habitat components allowing native wildlife to continue their traditional use of the property . .") and Objective 4 ("preserve the land's watchable wildlife . ."), and the extent to which Objective 5 (i.e., "provide diverse recreational opportunities . .") may be achieved without compromising the higher management priorities.

Simply, this section of the management plan presents analysis and recommendations for allowing as much desired recreational opportunity on Mount Jumbo as possible and practical without unduly risking the abandonment of the Mount Jumbo winter range by the elk herd.

Concerns surrounding elk (and mule deer) winter and early spring use of Mount Jumbo are unique, and are the only concerns that merit the consideration of large area closures to the public to provide critical space and security for wildlife. Closures are employed as a management tool by the Montana State Fish Wildlife and Parks Department as well as the Forest Service, and are addressed in the *Missoula Urban Open Space Plan*, which states:

> Ready access to the open space system is one of the vision's most basic guiding principles. This does not mean that every area of open space must be fully accessible to the public. There are sound environmental or economic reasons for keeping certain open space lands 'off limits' to people, either year-round or at particular seasons of the year. Ready access does mean that all geographic areas of the community and all population groups have a variety of open spaces and outdoor recreation experiences available and convenient to them.

Other management concerns for wildlife may be adequately addressed in conjunction with habitat protection and enhancement (i.e., Objectives 1 and 2) in the vegetation and public use sections of the *Mount Jumbo Management Plan*.

Issues and Opportunities

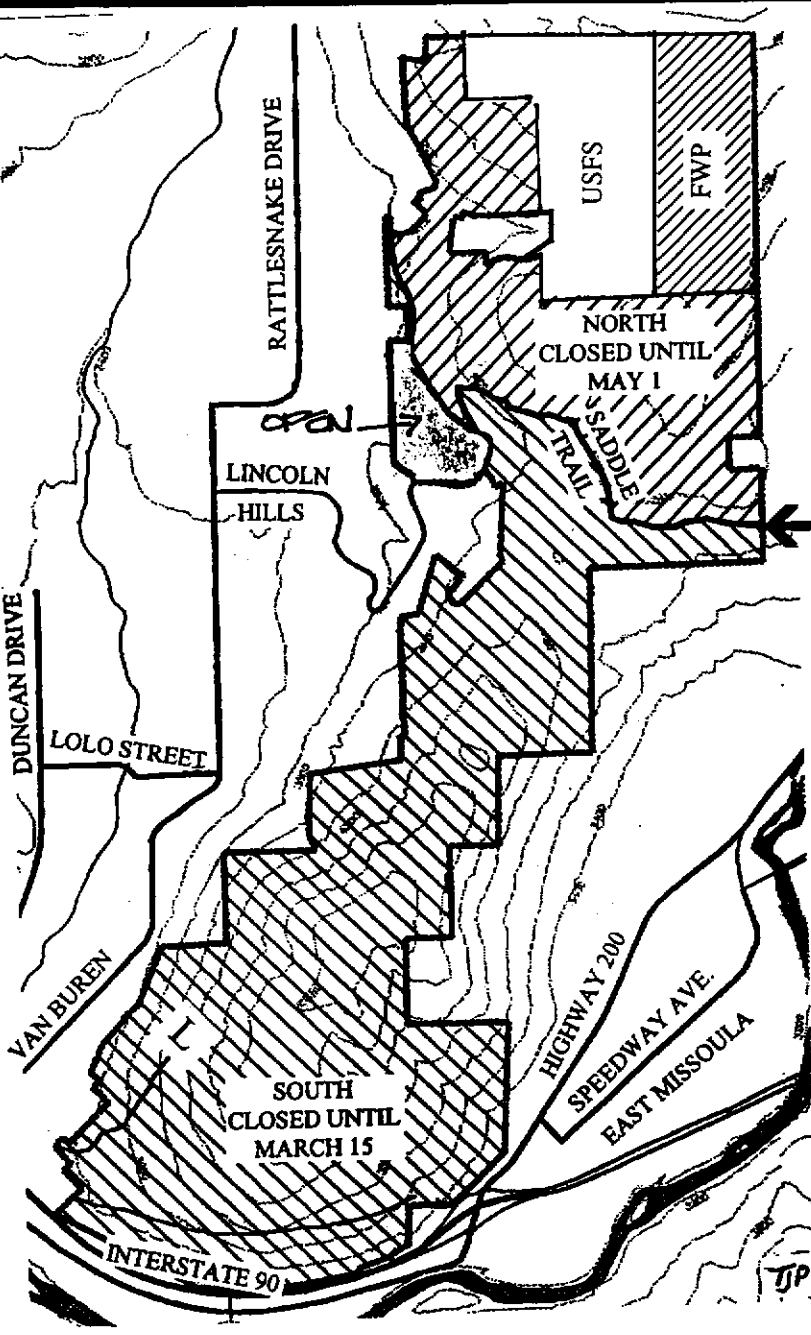
Mount Jumbo provides habitat for more than 100 vertebrate species. The largest and most visible are the wild ungulates, or hooved animals, that are primarily dependent on Mount Jumbo during the winter and early spring months. Protection of elk winter range was a major objective of citizens, local organizations, and local government agencies in the decision to publicly acquire Mount Jumbo. The city and state acquisitions on Mount Jumbo have prevented residential development from destroying this important winter habitat (see the *Mount Jumbo Natural Resource Gazette* for an explanation of the effects of residential development on elk and deer).

With the habitat protected, it is now in the hands of Missoula citizens to work cooperatively to provide the space and security elk require to continue using Mount Jumbo during the critical winter and early spring months, and preserve current viewing opportunities from homes, businesses and roadsides all across the city. Without adequate control of public access in winter and early spring, the risk of elk abandoning the Mount Jumbo winter range is high.

The challenge is to first understand the tolerances of the wintering elk population for human activity, and then allow public recreational opportunities to approach--but not exceed--these predicted tolerances. This task is complicated by the fact that elk may not tolerate disturbance levels that some humans assume they should be able to tolerate. It is further complicated by the fact that elk appeared to tolerate limited association with humans in the past when relatively few citizens were willing to trespass or had obtained permission to use private lands on Mount Jumbo.

Now that the land is in public ownership at the fringe of a rapidly growing city, elk may not tolerate the human activities they tolerated in the past because more people will participate. Finally, any public use restrictions must be simple and understandable to allow people a fair opportunity to understand and comply. The Stewardship Subcommittee strove to apply as much creativity to this problem as practical limits and predicted elk tolerances allow.

Mt. Jumbo Winter Closure



Area North of Saddle Trail
CLOSED
December 1 - May 1

Saddle Trail

Saddle Trail and Area South
CLOSED
December 1 - March 15

TRAILS OPEN ALL YEAR:

* Trail to the "L"
* Trail along I-90
* Road between Upper Lincoln Hills & Tamarack, and land below

Thanks for your help:
The Open Space Advisory Committee
Montana Natural History Center
City of Missoula
Lolo National Forest
Department of Fish, Wildlife & Parks

If you have questions:
Contact Missoula Parks and Recreation
523-2758 or 523-4669

Elk Distribution and Winter Ecology

Numbers and Migrations: During winter and spring, 50-100 elk and 100-130 mule deer reside on Mount Jumbo. Most of the elk and about one-half of the mule deer are migratory. From May-October, elk are infrequent users of Mount Jumbo, having migrated to summer/fall ranges on the Lolo National Forest. In late fall, elk and many mule deer return to the Mount Jumbo area from these more northern summer ranges. Most elk and deer are on the winter range by December 1. Elk typically occupy the southern portion of Mount Jumbo during the most severe portions of the winter. From mid-March through April elk most often use habitat from the saddle north to National Forest lands. A few elk and more than 50 mule deer remain in the Mount Jumbo area throughout the summer and fall.

Winter Ecology: Please refer to the *Mount Jumbo Natural Resource Gazette* for detailed information on elk winter range. The following narrative briefly summarizes information from the *Gazette* and applies it to Mount Jumbo.

Winter and spring range limit the abundance and distribution of elk and deer populations, because forage is limited and environmental conditions cause physiological stress. No other suitable winter range is available to elk and mule deer that traditionally winter on Mount Jumbo because all nearby habitats are already fully occupied by humans and/or wintering populations of elk and deer.

Elk generally avoid areas of human activity and disturbance (Lyon and Ward 1982, Edge and Marcum 1991). Forest recreationists caused elevated heart rates and displacement of elk in Wyoming (Ward et al. 1973, Ward and Cupal 1979). Elk in Yellowstone Park displayed extreme avoidance of winter recreationists traveling on foot (Cassirer et al. 1992). Lyon and Ward (1982) concluded,

> . . it is important that recreational areas and access be kept away from elk winter ranges . . Winter range plays such a significant role in elk management that in some areas it is critical to continued elk survival.

Such information has been the basis for the Montana Department of Fish, Wildlife & Parks to prohibit human access as a matter of policy from December 1 to May 15 on public lands that the agency manages primarily for elk winter range values.

Observations of elk distribution on four winter ranges in the Missoula Valley support the findings of researchers that have documented elk avoidance of human disturbances elsewhere. These four are examples of areas purposefully dedicated to recreation. What is now the Blue Mountain Recreation Area (Lolo National Forest) once supported a wintering elk population. Since the creation of the Recreation Area in 1980, winter recreation has increased several fold, but winter elk use had declined to near zero by 1990. Mount Sentinel (University of Montana) and nearby Pattee Canyon Recreation Area (Lolo National Forest) appear to provide adequate elk winter habitat, but together they support few, if any elk. Likewise, few elk stay in the Rattlesnake National Recreation Area (Lolo National Forest), even though winter recreation is directed away from areas of concentrated elk use. On the other hand, more than 130 elk migrate through the Rattlesnake to spend the winter on privately owned (and undisturbed) land west of Rattlesnake Creek in the Grant Creek area.

Elk Ecology on the Mount Jumbo Winter Range: At the beginning of winter, elk utilize most of Mount Jumbo, foraging intensively on native bunchgrasses that typically are buried under fluffy snow that is easy to paw through. This early winter period is an important foraging opportunity for elk to conserve and add to accumulated fat stores before winter conditions become more difficult. Even in a "mild" winter, elk benefit from undisturbed access to this readily available forage during the early winter period because similar feeding areas at higher elevations are routinely covered with deeper snow.

As winter progresses in January and February, snows deepen and settle, forming layers of crust that are difficult to walk or paw through for food. Elk are typically in a "negative energy balance" during mid-winter because the energy needed to forage often exceeds the energy they obtain from their food. During this period of the winter, elk typically concentrate their use on steep, south and west facing slopes and ridges where the forces of wind and sunlight combine to expose spots of grass (i.e., the south one-half of Mount Jumbo). At this time, food is extremely limited and elk increasingly rely on energy conservation strategies and fat reserves for survival until the snow melts and green forage emerges in spring. Elk distribution and daily movements shrink. Any disturbance causes them to consume calories that cannot be readily replaced.

By early March, elk are in the poorest physical condition they will experience all year, particularly pregnant females as they approach the final trimester when rapid fetal development occurs. At this time, they are dependent on spring green-up, and undisturbed access to that green-up, to replace lost calories and supply energy

to developing fetuses. Green-up first occurs at the lowest elevations and on south and southwest-facing slopes (i.e., the south one-half of Mount Jumbo).

Elk energy requirements continue to increase as fetuses grow during the spring. Accordingly, elk select the most succulent forage, generally following the receding snowpack upward in elevation to feed on tender new growth. Since most of Mount Jumbo is free of snow at this time (i.e., mid March-April), elk are able to move more easily between bedding and feeding areas, and may feed in some human-impacted areas under the cover of darkness if provided with secure daytime bedding areas nearby. The area north of the saddle on Mount Jumbo serves as such a daytime bedding area and allows elk access to nighttime feeding opportunities on all portions of the mountain. By May 1, foraging areas have been exposed on upper elevation ranges along Rattlesnake Creek on the Lolo National Forest, and elk naturally disperse from Mount Jumbo to utilize them.

Calving normally occurs between mid-May and mid-June, as elk make their way toward their summer ranges. Although instances of elk calving on Mount Jumbo have been documented, the mountain is not an important calving habitat for the herd.

Risks to Elk and Elk Viewing: Uncontrolled human use of Mount Jumbo during winter and early spring presents high risks to elk and elk viewing. If human use becomes excessive in amount and distribution, elk may be expected to abandon the Mount Jumbo winter range. In the unlikely event that elk remain in the face of increased human use during winter, they will be subject to increased stress and decreased access to critical habitats during the period of the year when they are least able to respond. In either case, the result probably will be decreased survivorship (i.e., fewer calves or healthy calves born, and lowered calf survival through their first winter) and the eventual loss of this elk herd. An additional consideration is the small size of this herd (less than 100 individuals), which imposes inherent limitations on its resilience in the face of decreased survivorship. It is important to note that while this elk herd certainly is adapted to survive limited losses due to periodically severe winter conditions, its long-term persistence may be critically linked with the ability to recover and increase herd numbers and condition during mild winters, with full access to the resources available on the Mount Jumbo winter range.

As a general rule, elk are most likely to tolerate disturbances that occur below their occupied elevations on mountain slopes such as Mount Jumbo. Elk are less likely to tolerate human activities that occur at or above the elevations they prefer to

occupy, and also may abandon winter ranges that are isolated from adjacent elk habitat by human activity that completely surrounds them geographically. Thus, the saddle and the upper ridgelines of Mount Jumbo are critical winter security areas for this elk herd. These areas are regularly used by the herd as movement corridors, and they are natural escape routes. Elk on Mount Jumbo seem capable of maintaining a continual awareness of and limited tolerance for human activities below them, as long as escape routes over the ridgeline and saddle remain secure. However, experience has shown that wild elk will likely abandon and avoid habitats where escape routes are no longer secure or cannot be "trusted."

Management Strategy

The preliminary draft of Elk Winter Range described nine management alternatives, ranging from public access year-round to year-round closure. Appendix A presents a matrix comparing the predicted trade-offs of those nine alternatives. Public comment and discussion of the preliminary draft displayed strong public support of a winter closure to protect elk habitat. Based on public and agency comment and given the relatively good compliance with this year's closure the Stewardship Subcommittee, with the Open Space Advisory Committee's endorsement, recommends the following management strategy, referred to in the previous draft as Alternative Five, with two modifications:

> Mount Jumbo will be divided into two management zones, north and south of the saddle. Land lying north of the saddle trail, which runs more or less beneath the power lines, will be open to the public from May 1 through November 30. The saddle trail and land south will be open from March 15 through November 30. The "L" trail, the U.S. easement above I-90, and the road connecting Lincoln Hills and Tamarack Drive will be open year-round. See Map A. As stated earlier, this management plan in intended to be flexible and additionally is subject to two specific conditions:
>
> 1. The March 15 opening date for the southern zone is deemed to be appropriate for most years. Each year, however, Fish Wildlife and Parks will coordinate an interagency review of the opening date no later than March 1. Other agencies involved will be: City Parks and Recreation Department, the Lolo National Forest, Rocky Mountain Elk Foundation, and Five Valleys Land Trust.

2. The area around the trail to the "L" will be monitored for its effect on the elk and trespass during closure. The trail may be closed if compliance is less than satisfactory.

Administrative uses: Existing easements and management agreements allow access on Mount Jumbo to certain legally permitted individuals and entities for maintenance, enforcement and other administrative uses during closure periods. However, under any of the seasonal closure scenarios being considered, every attempt will be made to avoid and minimize administrative access to the mountain in consideration of the closures imposed on the public.

At the time of this chapter's adoption, City property located west of the road connecting Lincoln Hills and Tamarack Street was leased to a private individual. However, the Stewardship Subcommittee identified this leased area as an area that could remain open to public use year-round without negatively affecting the elk herd. At the termination of the lease this land will be open year-round to the public.

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Appendix A

Management Alternatives Presented in the Preliminary Draft

Appendix A

Management Alternatives Presented in the Preliminary Draft

ALTERNATIVES	RISK TO ELK	RECREATION	MGT COMPLEXITY/COST
1. (No action). Area would remain closed to public access	lowest possible risk, elk would be highly viewable October-April	None	simple. Difficult to enforce
2. Winter closure. Dec 1 to May 15	low risk, elk would be highly viewable October to April	Area open to recreation Mid May thru November	simple. Mod enforcement cost
3. Winter closure. South of saddle Dec 1 to Mar 15 north of saddle Dec 1 to May 1	low risk, elk would be highly viewable October to March	Some/all of area open to recreation Mid March thru November	reasonably simple. Mod enforcement cost
4. Winter closure. like alt #3 but w/ US WEST right-of-way and road from Lincoln Hills to Tamarack open yearlong	low risk, elk would be highly viewable October to March	Some/all of area open to recreation Mid March thru November, Limited winter recreation opportunities	reasonably simple. Mod enforcement cost
5. Winter closure. like alt #3 but w/ trail to "L", US WEST right-of-way and road from Lincoln Hills to Tamarack open yearlong	low risk, elk would be highly viewable October to March, except for south/SW end of the property where local displacement would occasionally occur	Some/all of area open to recreation Mid March thru November, Limited winter recreation opportunities	reasonably simple. Mod enforcement cost

ALTERNATIVES	RISK TO ELK	RECREATION	MGT COMPLEXITY/COST
6. Winter closure. like alt #5 but w/ road segment from Lincoln Hills to Danny O'Brien Gulch open 5/1 to 3/15, area below that road open to winter rec	Mod risk, elk would probably be viewable Oct-Mar, but could be periodically displaced, especially on north end of the Mtn	Some/all of area open to recreation mid Mar-Nov, limited winter recreation opportunities	complicated, Mod-high enforcement cost
7. Winter closure. like alt #6 but open road segment from Lincoln Hills is extended to the first switchback, open 5/1 to 3/15, area below open to winter rec	Mod/high risk, elk would probably be viewable Oct-Mar, but likely would be displaced on the north end of the Mtn	Some/all of area open to recreation mid Mar-Nov, moderate winter rec opportunities	complicated, high enforcement cost,
8. Limited winter closure. Like Alt #7 but trail to top of Jumbo, and saddle area open yearlong	high risk that elk would no longer use Mt Jumbo	Most of area available yearlong for recreation	Very complicated. High enforcement cost
9. Total area open yearlong for recreation	high risk that elk would no longer use Mt Jumbo	All of area available yearlong for recreation	Simple. Low enforcement cost