

BENT TREE FOREST STEWARDSHIP MANAGEMENT PLAN

GOOD INFORMATION + SENSIBLE CHOICES =

A SAFER AND HEALTHIER FOREST



EARTHBOUND CONSULTING

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October 1997

TITLE PAGE

Bent Tree Property Owners' Association
Forestry Planning Committee
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Legal Description: See Appendix 1

El Paso County, Colorado

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Date: October 1997

"This management plan has been prepared at our request to guide our stewardship management activities which we will voluntarily apply on our properties. We believe that the activities recommended in this plan are appropriate to meet our objectives and will benefit the natural resources on our properties. We intend to apply the recommended practices and to maintain them for a period of at least ten years, thus helping us to be a good stewards of the forest and associated resources entrusted to us on our properties."

Name: 

Date: October 29 1997

President, Bent Tree Property Owners' Association

Approval: 

Date 10/29/97

SUMMARY

This plan was prepared at the request of the Bent Tree Forest Stewardship Committee for the purpose of providing Bent Tree property owners with basic information and guidelines needed for planning and implementing good forest management practices. These practices reduce wildfire risk, and encourage property owners to be good stewards of native plants and animals on their lands.

It is not mandatory for property owners to implement the management practices presented in this plan unless the practice is also specifically required by Bent Tree Protective Covenants. However, support and implementation of this Forest Stewardship Plan is strongly recommended. Noxious weed control is mandatory under state law.

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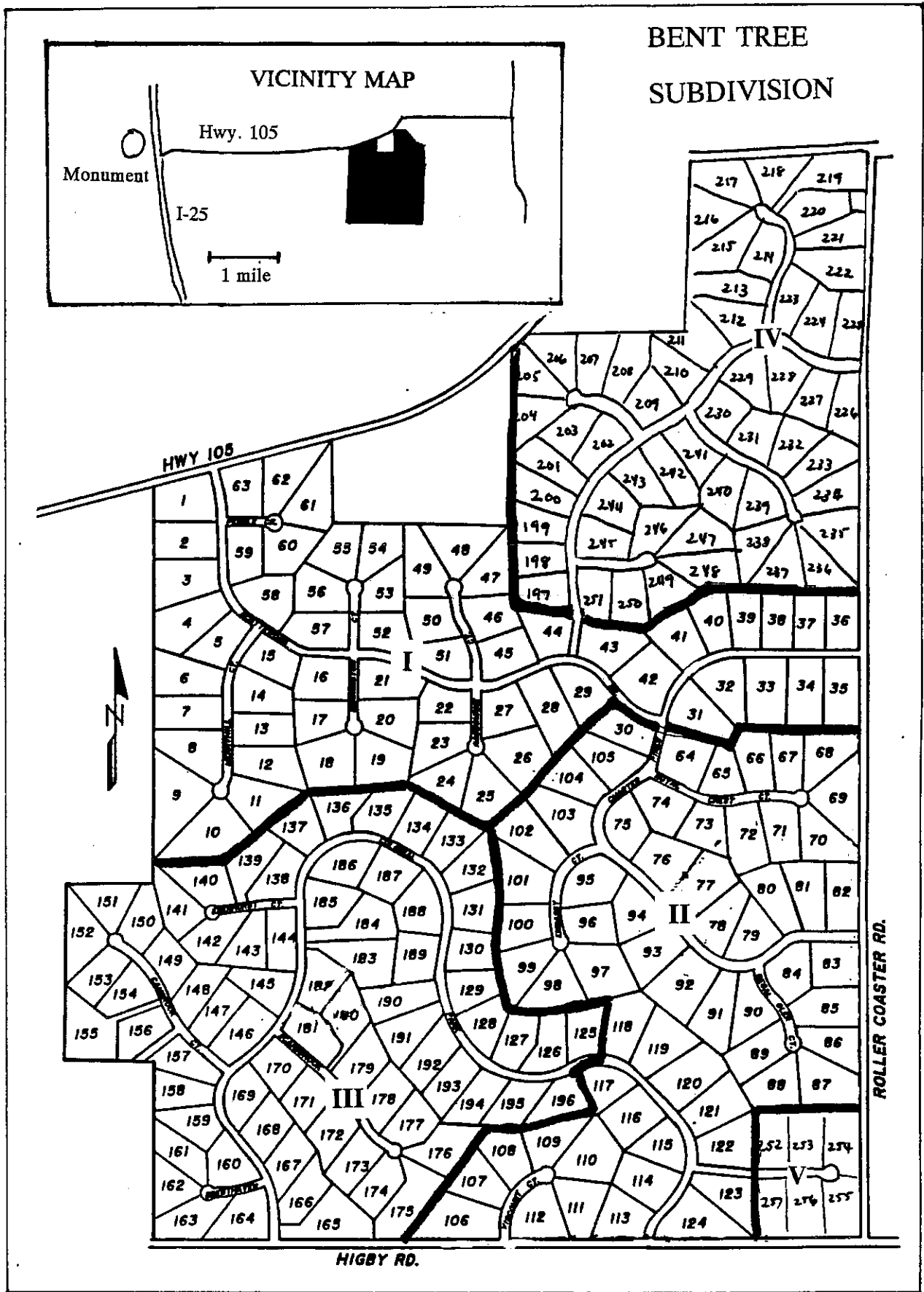


Figure 1. Location and lot plan.

I. OBJECTIVES

The Bent Tree Forest Stewardship Plan has several objectives:

- education of homeowners in maintenance of Black Forest ecosystems
- identification of possible landscape management actions and expected results
- development of forestry guidelines at the individual lot, neighborhood and subdivision levels
- increased awareness of wildfire mitigation actions

The plan will provide benefits to landowners through:

- improved property values
- healthy ecosystems
- wildfire danger mitigation
- shared environmental values

Property values are improved by maintaining views and eliminating noxious weed infestations. **Healthy ecosystems** include reduced tree losses from insect infestations and disease, improved tree growth and vigor by reducing competition stress, reduced soil erosion, improved ground cover, restored native ecosystem characteristics and enhanced wildlife habitat. **Wildfire danger mitigation** reduces chances for canopy fires, improves conditions for cool surface fires, creates defensible space around buildings, identifies fire safety measures, and encourages a fire pre-attack plan coordinated with local fire fighting organizations. **Shared values** include pride in community cooperation to create and implement a plan to care for ecosystems to perpetuate native forest and grassland ecosystems.

The Forest Stewardship Committee of Bent Tree Property Owners' Association has an excellent "Forestry and Wildlife Information Packet" for landowners on tree care, fire prevention, wildlife habitat enhancement and other topics. An approved Forest Stewardship Plan makes the Bent Tree community eligible to apply for state Stewardship Incentive Plan (SIP) funding (Appendix 7) and is an additional step to assist landowners in creating a safe and beautiful environment.

II. BENT TREE SUBDIVISION

GENERAL DESCRIPTION

Location

Bent Tree Subdivision is located on 792 acres in northern El Paso County, Colorado south of El Paso County Highway 105, west of Roller Coaster Road and north of Higby Road (figure 1). One hundred ninety six platted 2.5 to 4 acre lots are included in Bent Tree Filings I (1985), II (1988) and III (1993).

One system of access roads in Bent Tree I and II links El Paso County Highway 105 with Roller Coaster Road. Bent Tree III has cul de sacs and a loop road off Higby Road. Bent Tree Filings IV and V, consist of two areas, in preliminary development in 1997. Bent Tree V is on the meadow at the southwest corner of the property, and Bent Tree IV is a forested area at the northeast edge of Bent Tree I. The total number of lots will be 257.

Geology

The Dawson Formation beneath Bent Tree Subdivision was deposited by sluggish rivers during the Paleocene and early Eocene Epochs from 35-65 million years ago. Sediments from eroding mountains to the west were deposited as thick layers of interbedded sand, silt and clay below what is now the Black Forest area.

Weakly cemented arkosic sandstones are characteristic of the Upper Dawson Formation. Arkose is a type of sandstone with a high feldspar content which forms from disintegrating granite parent materials. The highest remnant of the Upper Dawson Formation is Bald Mountain, just northeast of the Monument Hill pass, north of County Line Road and northwest of Bent Tree. The lowest layers of the Dawson Formation are beneath the mesas and buttes of north-central Colorado Springs, including Palmer Park.

These poorly consolidated, geologically young rocks, are highly susceptible to erosion, decomposing into clay, silt, sand and gravel.

Several small patches of younger Quaternary Period outwash alluvium are near the center of Bent Tree IV. Some hillslopes in Bent Tree III are covered with this alluvial material also.

Topography

The subdivision is bisected by the Palmer Divide ridge (Platte-Arkansas Divide) from northwest to southeast (figure 2). This ridge generally separates Bent Tree I and II from Bent Tree III. The two Bent Tree IV parcels are both north of the Palmer Divide. The arrangement of lots and roads is predicated on this topographic pattern.

The gentle northeast-sloping land surface north of the Palmer Divide ridge is in the West Cherry Creek Valley of the South Platte River basin. South of the ridge, steeper slopes are part of the headwaters of Jackson Creek which is tributary to the Monument/Fountain Creek system of the Arkansas River basin.

The south-southwest aspect of upper valleys of Jackson Creek combined with the slope steepness, makes Bent Tree III, south of the ridge, hotter and drier than the northeast-facing plateau beneath Bent Tree I, II and IV.

Soils

The Kettle Soil Series (gravelly loamy sand) is found on both sides of the ridge (figure 3) (Larsen, 1974). The Kettle Series is divided into two slope classes; 3-8% slope north of the ridge (class 40) and 8 to 40% slope south of the ridge (class 41).

The upland meadow at the southeast corner of Bent Tree is on moderate to well-drained Tomah-Crowfoot Series loamy sand 3 to 8% slope (class 92), formed from outwash from higher slopes. This meadow is at the head of a tributary of West Cherry Creek.

The meadow west of and downstream from the drainage easement at the west edge of Bent Tree III, in the Jackson Creek valley, consists of poorly drained Alamosa Series loam (class 1) at the bottom of a wet meadow and Tomah-Crowfoot Series loamy sand 8 to 15% slope along the south-facing edge.

Soil differences within Soil Series are due to local microtopography. Steep slopes and high susceptibility to erosion are at one extreme, while and flat areas are at the other extreme. Organic matter does not accumulate on steeper slopes, especially if there has been disturbance to ground cover due to logging or mechanical damage from vehicles. Thus, erosion and stunted tree growth is a key attribute on the south side of the divide while soil stability and potential for larger, faster-growing trees is greater on the north side.

Climate

The Palmer Divide is well-known for climatic variability and extremes. From a 7300 foot elevation at Monument Hill Pass, the Palmer Divide rises southeast through Bent Tree subdivision to a maximum of about 7800 feet at Vollmer Hill in Black Forest about seven miles to the east.

Bent Tree elevations are between 7400 and 7500 feet, along the rise of the Palmer Divide ridge west of the Rampart Range. The Palmer Divide ridge interacts with frontal air masses from the north and south, and receives more moisture at all seasons than lower elevations in Colorado Springs or Denver.

Prevailing winds during the late spring and summer months are from the south-southeast because of the northward circulation of moist Gulf air. Influence of the Arizona Monsoon during July and August brings additional precipitation and more variable wind directions. Fall and winter winds are variable depending on the position of the Polar Front Jet Stream, dominance of westerly Pacific air flow, Arctic fronts or storm influences from lows to the south, southeast or southwest.

Strong winds are most often from the south, west, southwest or north during dry or cold weather and frontal passages.

The nearest long-term weather station is located in Monument, Colorado. The record since 1931 is discontinuous with some entire years missing, and others incomplete. Average monthly precipitation and temperatures for years of record from 1931-1985 are

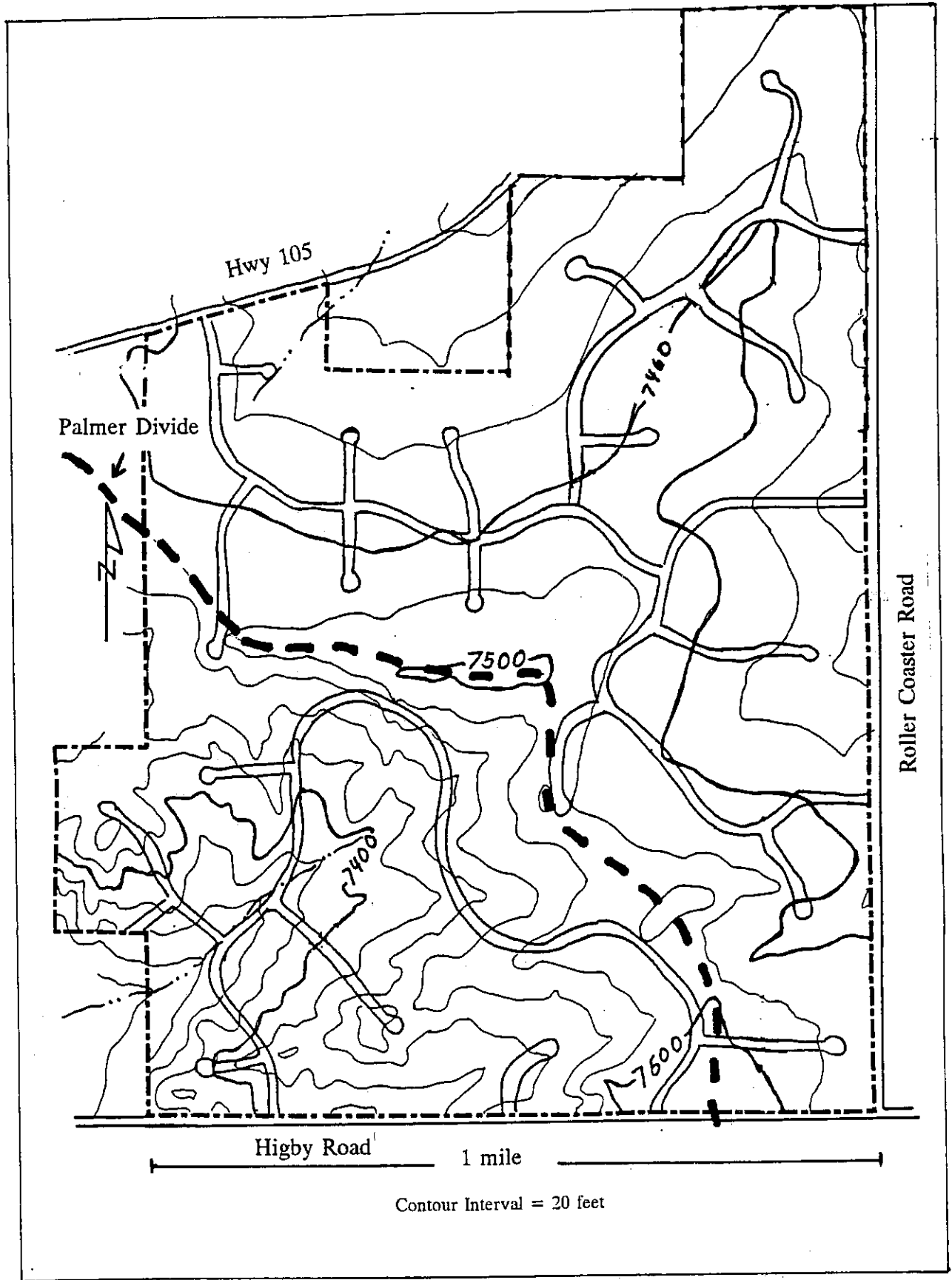


Figure 2. Topography, and location of Palmer Divide.

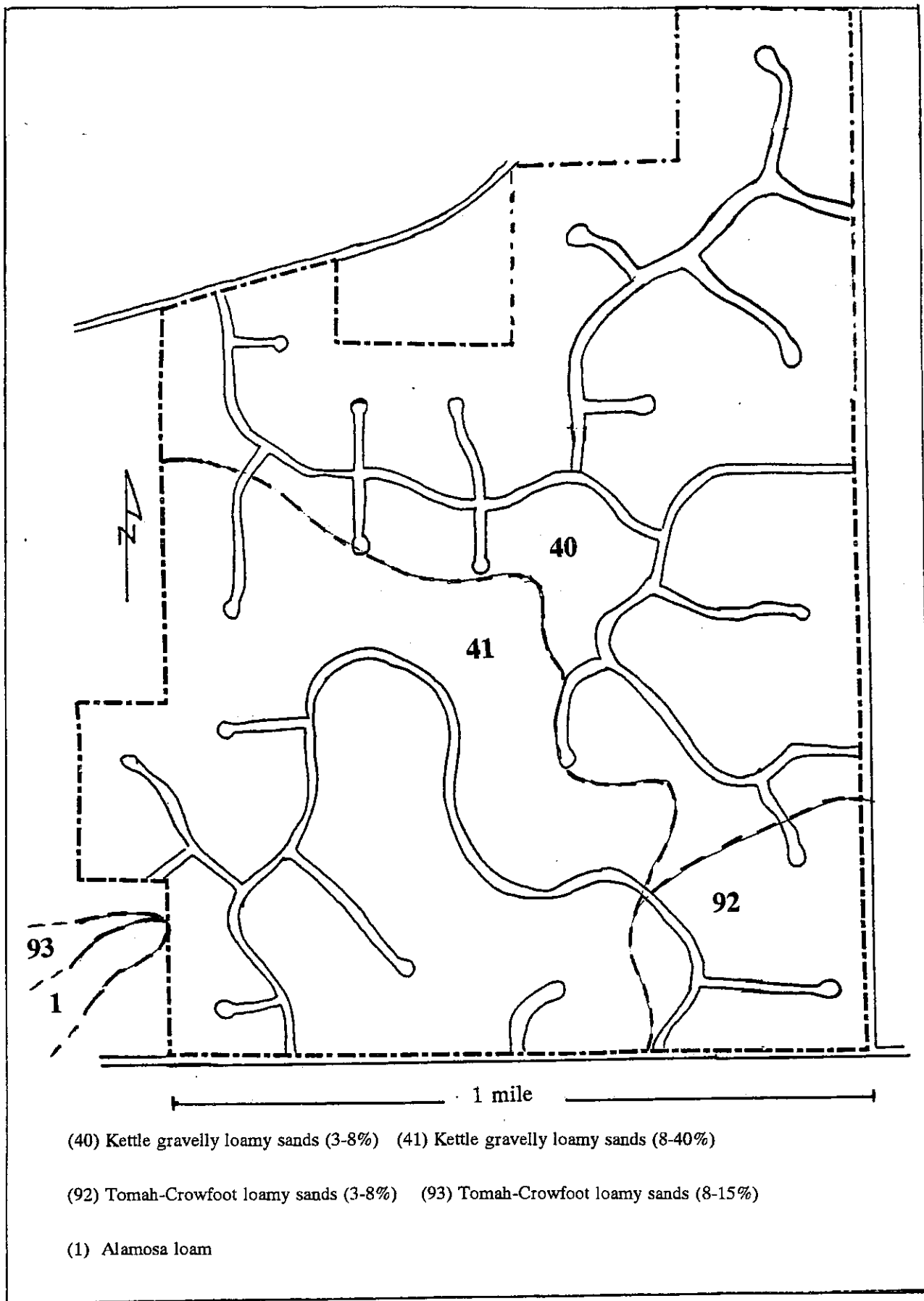


Figure 3. Soil map of Bent Tree Subdivision. Adapted from Larsen, 1973.

shown in figure 4. Average annual precipitation during this period was 20 inches per year but ranged from a low of 9.37 inches in 1939 to a high of 29.93 inches in 1957. Average annual temperature was 46.6 degrees F with a range of 44.5 degrees F in 1961 to 49.3 degrees F in 1954. Higher or lower annual temperatures or precipitation may be expected.

Snowfall averages about 82 inches per year compared to Colorado Springs which averages 33 inches per year, and to Denver with a mean snowfall of 50 inches per year. Extreme snowfall from individual storms may be excessive with 24 to 40 inches or more of snow and subsequent drifting. The most recent heavy snow winter was in 1982-83. The late April storm of 1997 brought exceptionally heavy wet snow which caused many broken limbs and bent trees.

Variation of temperature and precipitation within and among months of the year, and between years, are very important to tree reproduction and fire risk.

FOREST ECOLOGY

Occurrence of ponderosa pine forests

As a species, ponderosa pine occurs from Mexico to Canada and down the west coast of the United States. Ponderosa pine communities at lower treeline (adjacent to grasslands) or on isolated escarpments occur throughout the Great Plains from Arizona to Montana and eastward to North and South Dakota and north-western Nebraska. Two other large areas of ponderosa pine east of the Rocky Mountains include the Black Hills, and Pine Ridge, in South Dakota.

Ponderosa pines are able to tolerate wide variability in climate and are drought tolerant. They require canopy openings with low competition from grasses to regenerate. Regeneration tends to occur episodically when good cone production years are followed by normal to wet climatic years which enable seedling establishment. The frequency of this probably varies on the order of 5 to 15 years along the Front Range.

When mature, ponderosa pines are resistant to cool surface fires because of thick bark and natural pruning of lower branches. Ponderosa pines growing in open environments retain their lower limbs longer than those in dense forested stands. Retention of lower branches may result in destruction of the tree during grassland fires, and may have been a natural process which prevented colonization of meadows by trees.

Forest Processes

Naturally occurring processes kill or deform, as well as regenerate trees. Many of these processes are periodic, often responding to large-scale climatic variations. Destructive processes include surface and canopy fires, insect infestations, high populations of parasites such as dwarf mistletoe or various fungal infections, lightning strikes and herbivory.

In the Black Forest, ponderosa pine regeneration is prolific. The suppression of fire and elimination of porcupines, squirrels, rabbits and other plant-eaters which would naturally thin young growth has resulted in thickets of crowded trees in many areas. Because the pines regenerate best in openings, it is necessary to thin trees periodically to prevent undesirable crowded regrowth which results in spindly trees, elimination of understory species and increased fire hazard. It is much easier to thin trees while they are small than to remove larger crowded ones.

Severe canopy fire is the most destructive periodic process which affects ponderosa pine forests. Other periodic large-scale disturbances include death of trees from mountain pine beetle infestations and windthrow. These can change forest structure relatively rapidly.

Dwarf mistletoe infection has a long, slow cycle which is naturally interrupted only by severe fire. Spread of dwarf mistletoe and mountain pine beetle populations is aided by overcrowded stands of trees.

Destructive crown fires which remove infected tree populations is a natural part of ponderosa pine forest ecology. Low intensity surface fires which remove crowded stands of small trees (doghair stands) and thick

Climatogram for Monument, CO
1931-1985

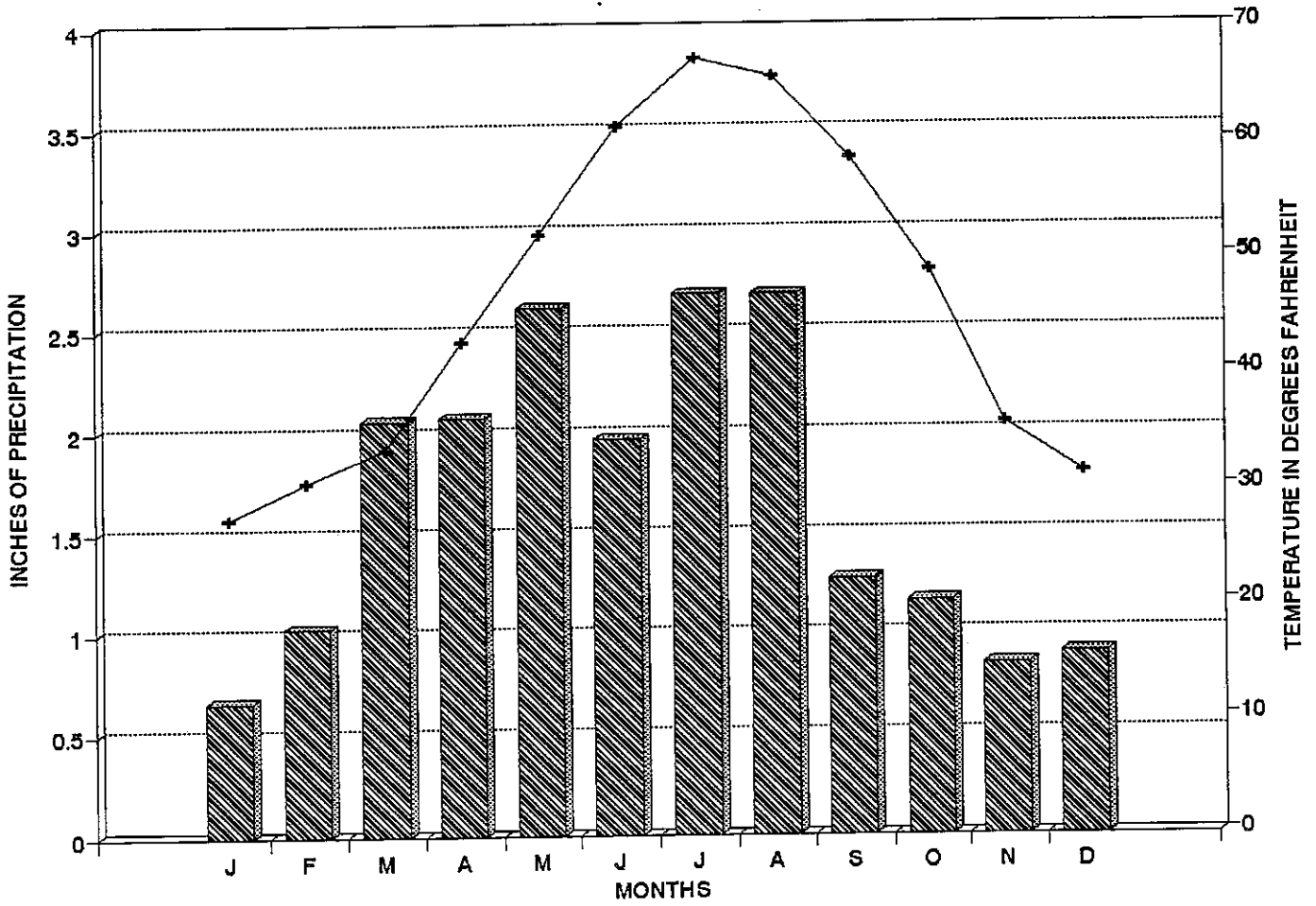


Figure 4. Average monthly temperature (line) and precipitation (bars) for Bent Tree area. Data from von Ahlefeldt, 1992.

layers of accumulated pine needles (which inhibit growth of grasses and other understory plants), occurred often enough in the past to remove many suppressed seedling, sapling and pole sized trees. Low-intensity fires thus maintained well-spaced tall trees, and reduced populations of small to intermediate size trees. Surface fires recycle nutrients and reduce competition among young trees. Surviving trees grow better because competition is reduced.

From our human perspective, as we value trees, the results of these processes are often labeled as "bad" or "undesirable". Yet results of each of these disturbances to individual trees or whole areas, while destructive in part, enable other parts to flourish and add diversity to forest structure and species composition.

Damage to individual trees by windstorms, lightning or dwarf mistletoe provides habitat diversity for cavity-nesting birds and other species. Herbivory by squirrels and porcupines eliminates some trees, slows the growth of others and provides variation in tree structure which adds to visual and habitat diversity. Herbivory prunes the canopy and reduces tree crown width.

While mountain pine beetle infestations, dwarf mistletoe infection and seasonal herbivory by porcupines and Abert's squirrels are the most common, and perhaps the most visible, alterations to trees by animals, there are many other insect feeders and fungal parasites which affect ponderosa pines and cause less observable changes in trees.

ECOSYSTEM DIVERSITY AND INTEGRITY

Biological diversity refers to kinds of species of plants and animals in an ecosystem. Ecological integrity refers to the presence and persistence of NATIVE plants, animals and ecosystem processes.

An area of Bent Tree with Russian olive, diffuse and spotted knapweed, musk thistle, Kentucky bluegrass, blue spruce and fox squirrels is biologically diverse, but that ecosystem does not have the ecological integrity of an area without these exotic species, but with native

ponderosa pines, kinnikinnik, mountain muhly grass, aspen, and chokecherry.

Ecosystem history

The rise of the present Rocky Mountains, about 20 million years ago created the basic pattern of the landscape as we know it today with the Front Range to the west and the Platte and Arkansas River drainages flanking the Dawson Formation on the north and south.

Although some local outwash deposits date from colder and wetter climates of glacial times 10,000 to 100,000 years ago, the Black Forest was not covered by glaciers during the Ice Ages. Thus the lineage of plant and animal life in the Black Forest region has been essentially uninterrupted for many millions of years.

Fossil records from the Great Plains and nearby mountains (for example at Florissant Fossil Beds) show that many relatives of familiar plants such as pine, spruce, grasses, shrubs and forbs were present 30 to 40 million years ago. Biological lineages of animals such as prairie dogs and antelope also reach back to these ancient times throughout the central and southern Great Plains of North America.

Continental glaciers receded from northern Montana and North Dakota only about 12,000 years ago. During both glacial and post-glacial times plant and animal populations dispersed throughout the Great Plains in various ways, responding to long-term warm/dry and cool/wet climatic cycles.

During warm dry times, especially 4000-7000 years ago, populations of plant species from the southwest, such as cactus and yucca, migrated northward. During this time patches of spruce forests and other woodlands were eliminated from lower elevations by fire and climatic pressures. Drought resistant pines such as ponderosa pine, piñon pine, which migrated northward from Mexico, were able to persist at the grassland/forest border throughout the western Plains.

Populations of some species typical of colder climates remained, while other populations invaded the Great

Plains from the eastern or southern prairies. The Little Ice Age, one of several cooler and wetter periods than present, occurred from about A.D. 1600 to A.D. 1850.

Thus, by the time of western settlement in the 1850s/1860s, species whose presence resulted from complex factors dating to prehistoric times, constituted native ecosystems of Black Forest.

Native and exotic species

Many species now found in the Bent Tree area are newcomers from Europe and Asia. These include crested wheatgrass, smooth brome grass, Kentucky bluegrass, Russian knapweed, Canada thistle, and a host of small weedy annual species. Other plants have been brought by man from other parts of the United States, for example New Mexican locust and California poppy. Others, for instance Austrian pine, Scots pine, Russian Olive, Siberian peashrub and lilac are from Europe or Asia and have been brought in by humans.

Similar events have happened with animals with arrival of the house mouse, eastern white-tailed deer, fox squirrel, raccoon, and domestic livestock. It is a matter of value and belief as to whether or not these changes are good or bad.

At issue is the concept and value of ecosystem integrity - persistence of native vegetation and fauna which make an area different from other places and which allow historical ecosystem-sustaining processes to occur. In order to make choices to perpetuate ecosystem integrity or not, it is necessary to consider this issue when deciding on landscaping and land-management practices.

III. LAND INVENTORY

SITE HISTORY

Long-term records of land uses specific to Bent Tree are not available, but it is likely that the site was logged repeatedly since 1860. The oldest trees are mostly less than a century old.

Proactive management of the Bent Tree forested area now spans more than a quarter century. The property, consisting of three separate parcels, was acquired by the partnership of Bob Moore, Kenneth H. Barber and John B. Wogan in the late 1960s. A long-term forestry program was fostered to create a healthier, more open forest, adding value to future individual lots.

Initially the forestry program consisted of tree thinning by the Colorado State Forest Service to slow the mountain pine beetle epidemic of the late 1970s by reducing tree density. The initial pattern of thinning resulted in a single canopy layer of widely spaced trees under which thick groups of seedling trees regenerated over the next 15 to 25 years.

In 1979 the first of several extensive thinnings by contractor/forester Len Lankford began in conjunction with clearing for roads and preparation of individual lots for sale in Bent Tree I. Because the mountain pine beetle epidemic was still a concern, increasing space between tree trunks to reduce root competition and strengthen resistance of individual trees to mountain pine beetle attack was a key element in this part of the forestry management process.

Creation of space between individual tree canopies was also an objective. This reduced fire hazard, improved understory growth of grasses and shrubs, and created views. Retention of trees to provide screening from roads or other homes was also important. Character trees were retained.

A primary objective of later thinnings was to create a multiple canopy layer forest of mixed ages and heights, rather than a single upper canopy layer. Efforts were made to create front and backyard settings for house sites with open forest patterns around building sites.

Nearly twenty years later, in A.D. 1997, canopies of thinned areas have again begun to close because tree canopy diameters have increased. Smaller trees have colonized canopy gaps. The rate of both tree height and diameter growth increased after all types of thinnings.

In Bent Tree II a large area of severe dwarf mistletoe infection was clearcut in the 1980s, and uninfected areas were buffered from small pockets of infection by clearcutting a zone around infected trees to slow dwarf mistletoe spread. Since then, new trees, susceptible to dwarf-mistletoe have colonized the cut zones.

In Bent Tree III, viewshed considerations were emphasized, adding an additional dimension to traditional forestry objectives. Special efforts were made to provide views to the southwest from each lot in addition to creation of mixed aged, thinned stands. This resulted in removal of trees in long strips, mostly along adjoining property lines. Building sites were specified for each lot with a southwestward view across these openings.

The viewshed thinning produced a parallel pattern of canopy gaps and provided generous spacing between corridors of trees. Individual trees were removed within the corridors to promote adequate canopy spacing and create better growth conditions. This pattern also served to some extent to create fuelbreaks and was initially open enough for emergency vehicles to pass through easily. New tree growth is beginning to fill in these cleared areas.

Thus the present variety in the pattern of forest age, vertical structure and horizontal spacing was created by ongoing processes of tree removal and tree growth. Both height and canopy diameter increase of existing trees and regeneration of new trees continually cause slow changes.

As forest structure changes in height and horizontal spacing additional forest management is needed to prevent the forest from reverting back to overcrowded closed stands with accompanying loss of views, decrease in property values and increase in fire hazard.

ADJACENT SUBDIVISIONS

Bent Tree is surrounded by heavily forested, generally unthinned areas on all sides except for the large meadow which borders the southeast corner of the subdivision. Arrowwood and Canterbury subdivisions to the east and west have not been thinned, nor has the Higby Ranch to

the south. Kingsdeer, to the north, has had little thinning of dense forest, but does have large non-forested areas.

VEGETATION

Forest Structure

The number and kind of tree canopy layers is called vertical structure. Horizontal structure refers to the arrangement of treed and non-treed areas across the landscape.

Landscape mosaics include both horizontal and vertical structure and have many size scales, ranging from the immediate area around dwellings or individual lots to groups of lots, portions of a subdivision, the whole subdivision or the larger landscape which includes the subdivision and its neighbors.

The interactive role of all of these size scales must be recognized when considering forest thinning, fire spread, placement of fuel breaks, forest disease control, and creation of wildlife habitat.

The Presettlement Forest

The idealized mature presettlement ponderosa pine forest consisted of large, well-spaced trees sparingly interspersed with younger trees (figure 5a, 5b). The canopy was variously single or multi-storied, with trees of varied ages. Ladder fuels were generally absent in most areas and the forest presented an open appearance with a grassy or shrubby understory. Patches missed by fire had denser understories.

This kind of structure might better be termed a ponderosa pine savanna than a forest. Over large landscape areas there was a variety of arrangements from very open savanna (often on hillslopes and plateaus) to closer spaced trees where canopies touched or overlapped, forming a closed-canopy forest (often in ravines or other protected areas) (figure 5c).

Depending on recency of surface fire, the understory was either open and populated with grasses and shrubs, or

partly filled with groups of regenerating trees. Periodic surface fires eliminated most tree regeneration.

In other words, much of the tree biomass was eliminated while trees were small, therefore it was rare to have destructive crown fires because there was not a lot of woody fuel and tree canopies had space between them (non-contiguous or open canopies). Of course, over larger area, there would be places that surface fires missed or where destructive fires had occurred, so there would be some thickets of trees, and some open areas. Thickets of trees were likely the exception, not the rule. Occasional mortality of large trees created snags for cavity-nesting wildlife and birds.

A convenient way to visualize horizontal forest structure is to consider the matrix (what most of the landscape is like) vs patches (areas with different characteristics). For example, the presettlement forest may have had a matrix of ponderosa pine savanna with large trees varying in age from 70 to 350 years, with patches of clumped regeneration of different sizes, burned areas, openings featuring grass and shrubs, and groups of snags or deformed individuals providing habitat for cavity-nesting wildlife and birds.

The Modern Forest

Black Forest today has a pattern opposite to the ponderosa pine savanna. The matrix is mostly closely spaced trees having slender trunks in proportion to their height, thick clumps of regeneration of all sizes and, mature trees with contiguous canopies forming large areas of closed forest susceptible to crown fire spread.

Masses of young trees, and crowded groves of mature trees, have resulted from past forest management in Black Forest and set the stage for intense, destructive fires, severe mistletoe infection and periodic epidemics of mountain pine beetle.

Areas that have been thinned require ongoing management to prevent the buildup of biomass that naturally occurs in the absence of forces that remove prolific tree reproduction.

The understory is also affected by vertical forest structure because little light reaches the ground, tree roots compete with grasses and shrubs and thick layers of pine needles inhibit growth of other species of plants.

Property owners in Bent Tree are fortunate because the developer chose to thin trees before the lots were sold. Because new trees colonize opened areas within a few decades, and canopies of older trees enlarge, continued thinning is necessary to retain landscape characteristics created during the forest management efforts of the late 1970s and early 1980s and to reduce fuel loads.

Low elevation ponderosa pine forests in the 7000-8500' elevation range along the Colorado Front Range have become popular sites for residential subdivisions in the past 40 years. Human dwellings and other modifications have been integrated into forests which have underlying natural long and short-term cycles, some of which are inhospitable to human uses or not desirable from the perspective of aesthetics, landscape design or property values.

In today's managed forests there are many ways to arrange key landscape elements. It is important to understand what each contributes to fire safety, wildlife habitat, visual characteristics and other values of interest to humans who control the pattern.

Forest Growth

There are limitations on what can be expected for overstory and understory plant growth in specific areas of Bent Tree. These limitations are based in the inherent properties of the site, or may result from past land uses or soil loss. North and east-facing slopes are cooler and wetter than south and west-facing slopes. In general, larger trees will develop on flat sites. Growing conditions are better on north and east slopes for nearly all plants. Areas of steeper slopes, with little or no soil and a south to west exposure are always the most difficult sites for plant growth.

Ponderosa pine seedlings establish best in open areas where there is adequate light and lack of competition from

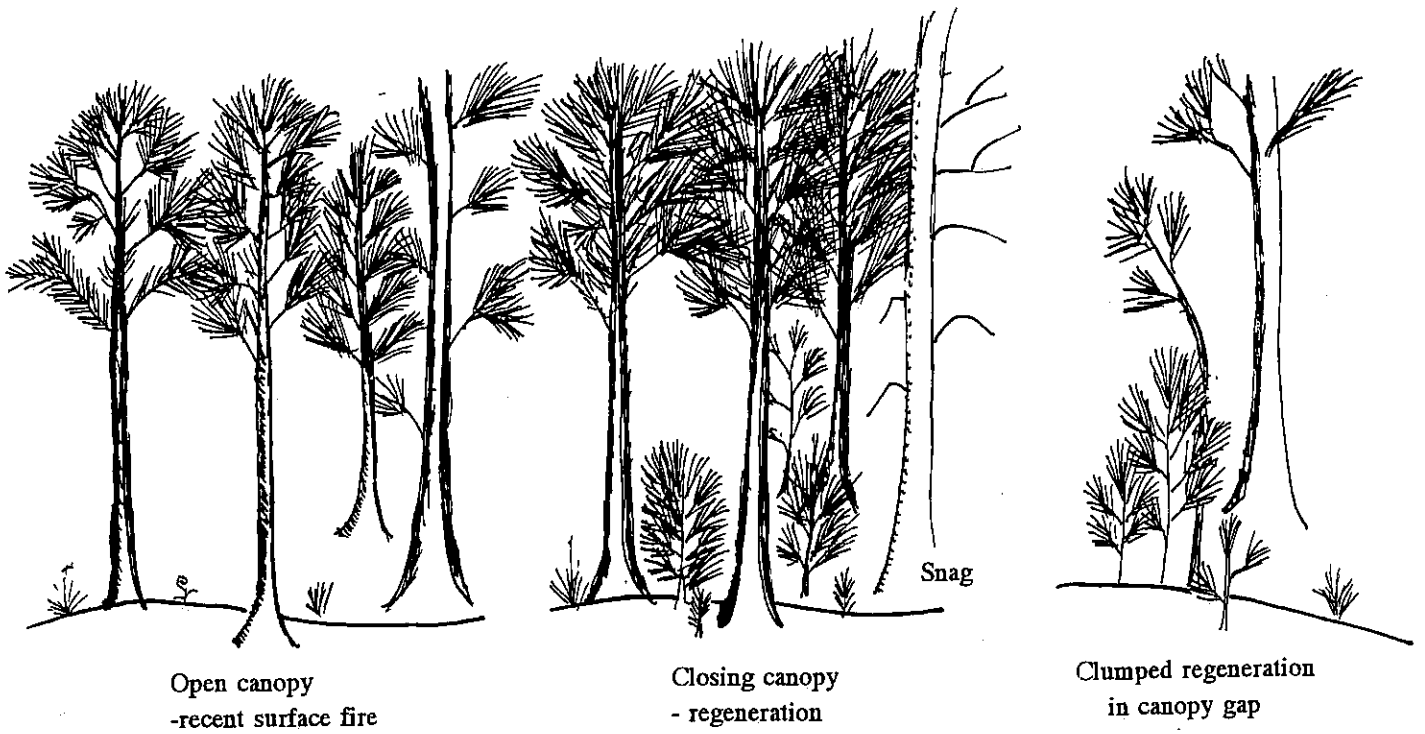


Figure 5a Schematic diagram of presettlement ponderosa pine forest

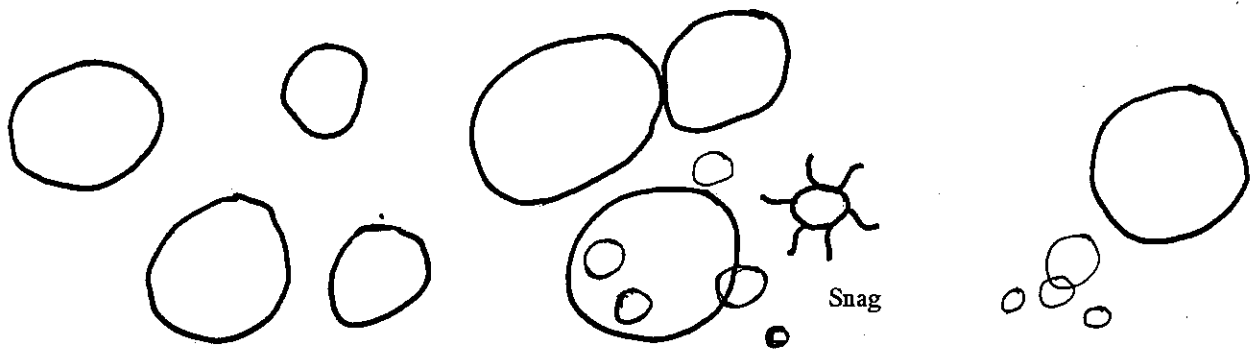


Figure 5b Canopy view of trees from Figure 5a

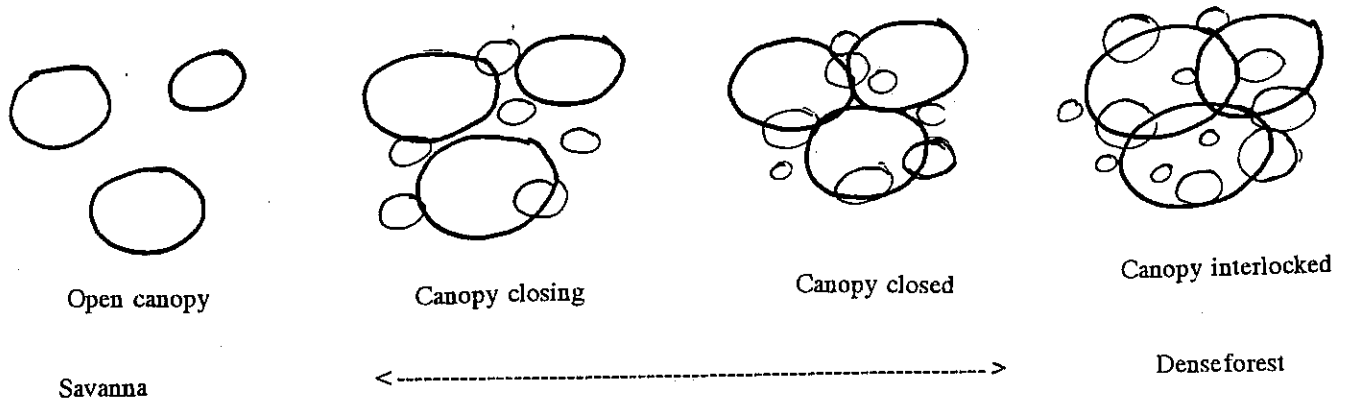


Figure 5. Forest structure.

surface roots of nearby trees. Open areas may be canopy gaps, edges of meadows or under large, fairly well-spaced trees. Usually seedling establishment is dense and often seedlings belong to one age cohort (figures 6a, 6b). These dense groups grow into doghair stands (figures 6b, 6c), often with little mortality. In the absence of fire, pine beetle epidemic, or purposeful thinning, these stands will stagnate and tree growth will be suppressed (figures 6c, 6d).

Stagnation is a forestry term that means trees grow very slowly in both height and diameter. This condition can persist for a long time (figure 6c, 6d, 7a). Thinning "releases" both the overstory and established seedlings and creates conditions for new seedlings to grow (figure 7b). This is what happened after thinning many areas in Bent Tree between the mid 1970s and late-1980s. Tree canopies were not touching after thinning and sufficient light reached the ground for regeneration to occur, sometimes vigorously.

Thinning "releases" the remaining trees, which begin to grow again because they have adequate light and rooting area. Released trees increase in trunk diameter, canopy diameter and height (figure 7b). Over time new groups of seedling establish when conditions are suitable. It is common to see several distinct cohorts of smaller trees near a parent tree.

After thinning the canopy closes again, because of released tree growth. Understory trees become large enough to pose ladder fuel hazards. This is the present, and developing condition for the next decade or two in much of Bent Tree (figure 7d, 7e).

Either single or multiple canopy layer patterns can be developed from this stage and perpetuated by selective removal of both large and small trees. (figures 6f, 7d).

Forest Health

A healthy forest can be defined several ways. A strict definition is the absence of damage or disease, i.e. no dwarf mistletoe infections, no mountain pine beetle infestations, no debarking or branch-clipping from

squirrels and porcupines, no damage from lightning strikes, no fire scars from surface fires and so forth. In this view each individual tree is growing as fast and perfectly as possible. It is immediately apparent that this definition does not accommodate many natural forest processes and animal associates.

Another view of forest health is to recognize the role of natural disturbance agents over time and to choose management levels for disturbance effects that are possible and tolerable given desired conditions. For example, tolerance for mountain pine beetle infestations may be zero because of the chances of rapidly occurring uncontrollable epidemics, while tolerance of dwarf mistletoe infestation may be higher because of its slow spread and less rapid effects on trees.

Debarking and branch clipping from squirrels and porcupines is a natural process and is only one of many disturbance agents which may alter tree growth patterns but rarely results in tree decline and death.

"Damage" to trees from herbivory, snowstorms, wind and lightning will occur over time. Most trees 30 to 50 years old or older have broken or damaged leaders, bending, or breakage from storms. Many trees 70 years or older will have lightning strikes.

Ponderosa pines usually survive herbivory and other physical damages and continue their life program. Damage to individual trees may disrupt perfectly symmetrical growth, and may slow increase in height, but rarely does it kill a tree. Thus, activities from squirrels or porcupines are not all "bad". The image of the "perfect" undisturbed tree is a cultural value, as is the human tendency to eradicate of natural tree associates which have roles in altering forest structure.

Dwarf mistletoe

Forest management in the past 25 years in Bent Tree has resulted in total removal of trees heavily infested with dwarf mistletoe in some areas, and buffering (removal of trees around infected areas) in other areas where retaining trees to preserve visual characteristics, or preventing

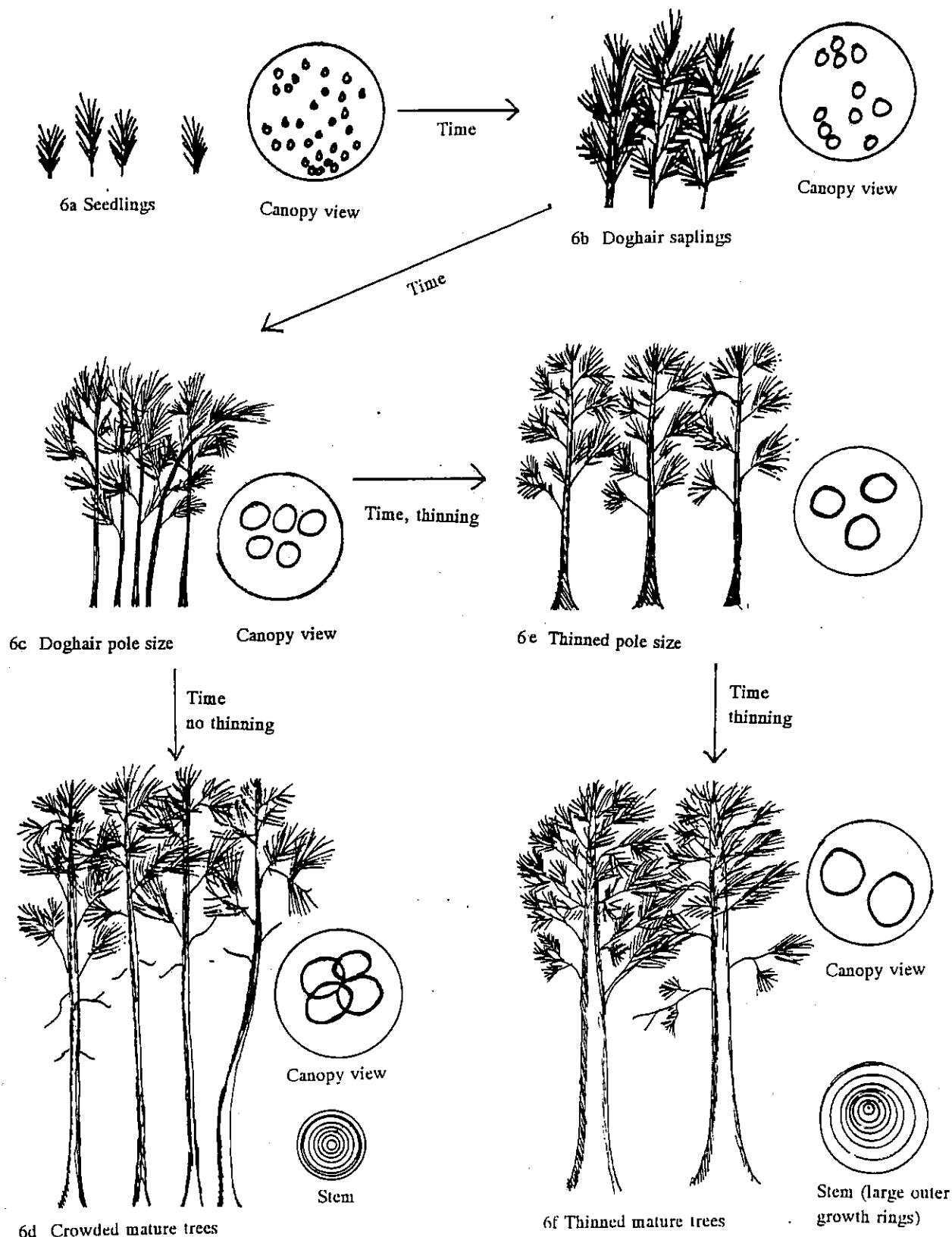


Figure 6. Forest growth.

erosion, were deemed more important than eliminating all dwarf mistletoe.

Dwarf mistletoe spreads by seed ejection from female plants in the tree canopy, infecting adjacent trees and understory trees. Sanitation cuts (clearcuts) will locally eliminate dwarf mistletoe, and buffering will slow its spread from seed ejection. Because birds and mammals also spread seed (and there are areas of severe mistletoe infestation in nearby areas outside Bent Tree), it is unlikely that mistletoe will be completely eliminated.

Areas of heaviest dwarf mistletoe infection are in hilly areas of Bent Tree III where ponderosa pines are less vigorous also because of slope, aspect and soil type. Heavily infected areas occur across Higby Road to the south. It is unlikely that dwarf mistletoe will be completely eliminated in Bent Tree III in the foreseeable future, but landowners can take short term measures to slow the spread of infection, eliminate infective overstory trees or plant other tree species not susceptible to dwarf mistletoe. See Appendix 2.

Mountain pine beetle

Mountain pine beetle populations do best in crowded ponderosa pine stands for several reasons, including dispersal distance to host trees, ease of finding mates, poor resistance by the trees to beetle entry because of low pitch volumes because of root competition for water, and generally poor vigor.

Uncrowded stands of trees support lower populations of mountain pine beetle for the opposite of these reasons. Presently, beetle populations are not high in the area, but trees should be checked on all properties each year during July and August. Infested trees should be cut down and treated with insecticide before beetles fly in mid to late summer. See Appendix 3.

WILDLIFE HABITAT

Large tracts of unoccupied areas south, east and north of Bent Tree harbor populations of wildlife. As these areas develop, some populations will likely change.

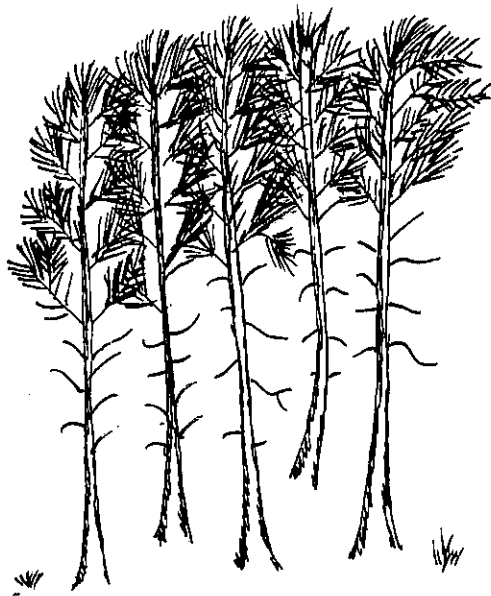
A variety of burrowing mammals including pocket gophers, voles and ground squirrels live in grassy openings. Raccoons are not native, but are known from some parts of Black Forest. Porcupines and Abert squirrels are native. Fox squirrel populations have expanded into the Platte River Basin in the past few decades and are now found in many parts of Black Forest.

Foxes and coyotes are common. Bobcats are occasional. Many species of songbirds and raptors associate with ponderosa pine forests and nearby upland grasslands. Red tailed, red-tailed and rough-legged hawks are common, golden eagles, bald eagles, northern goshawks, northern harriers and great horned owls are occasional.

The elevation and position of Bent Tree and its lack of wet meadow areas makes habitat generally unsuitable for reptile and amphibian species. Chorus frogs, garter snakes and tiger salamanders are the most common species. The five mile distance from the Front Range, interrupted by I-25 and intervening development probably has some effect on exchange of more mobile large vertebrate species such as deer, elk, bear and mountain lion with populations in the Front Range.

While the viewing and enjoying wildlife is usually considered an amenity of rural residential living, some wildlife species cause damage to property, have nuisance value, can kill and injure pets or serve as reservoirs of diseases. For example, woodpeckers drill holes (subsequently occupied by squirrels) in wood siding; rabbits, deer, squirrels, porcupines and other small mammals may eat ornamental shrubs; below-ground herbivory by burrowing animals destroys roots and kills ornamental plants; burrow openings cause trip hazards, and small pets become prey for foxes, coyotes, eagles and owls.

Some of these items can be mitigated by choices and design of landscaping, provision of snags, selective trapping, protection of plantings with fences and management of pets. Keep small pets indoors. Check with the Colorado Division of Wildlife before trapping or killing any wildlife species. Some are protected by law.



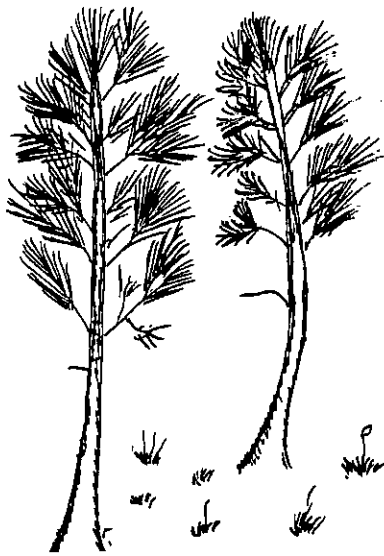
7a Stagnated stand

Thinning
→



7b Thinned stand with several stages of regeneration

Time
↓



7d Single canopy layer

Time
thinning
↖



7c Canopy closure
ladder fuels

Time
thinning
↖

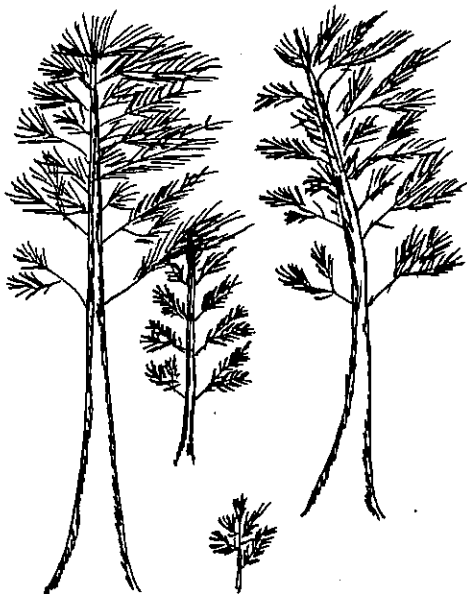


Figure 7e Multiple canopy layers

Figure 7. Forest sustainability.

At issue here is living with the forest ecosystem, rather than changing it to suit urban lifestyles. Some nuisance from wild animals should be expected and tolerated as a part of rural residential living.

Use of native species of plants, and natural landscaping patterns can prevent many problems. Avoid "built" landscapes near dwellings with structures like rockpiles, rock walls, and use of exotic plants which attract native herbivores which must then be "controlled" with rodenticides. In general, landscaping choices which retain native species and native landscape patterns will be easier and less expensive to maintain and will result in fewer "problems" with wildlife.

Habitat diversity is a key element in providing wildlife habitat. While this can be provided to some extent on individual 2.5 acre tracts, cooperative planning among homeowners to provide larger-scale areas will give a better result in small-tract subdivisions.

Forest openings containing shrubs, grasses and forbs are important food sources for many species of wildlife. To create a 2 to 3 acre opening will require cooperation among adjacent lot owners. Small piles of slash provides cover and protection for rabbits and other small mammals, but these should be placed where they do not pose wildfire fuel hazards.

Management for mixed aged forests with clumped tree distribution provides maximum choices for bird habitats. Abert squirrels prefer clumps of large trees, with interlocking crowns, for nest sites. Abert squirrel territories are generally 30 to 80 acres, depending on season and habitat area.

Carnivores are attracted to openings or areas with slash piles that provide good habitat for prey and good cover for hunting.

Many shrub species provide suitable berries, browse and cover for wildlife. Native species include common chokecherry, Saskatoon serviceberry, silver buffaloberry, golden currant, bitterbrush, skunkbrush sumac, and mountain mahogany. New Mexican locust and Apache plume have been imported in from the southern plains and

foothills. Non-native shrubs from Europe and Asia include lilac, Siberian peashrub and Alaskan currant.

Some tradeoffs are necessary because optimum fire-safe fuels management and optimum wildlife habitat are often conflicting. For example, doghair stands provide thermal and bedding cover, but can serve as ladder fuels; very open forest with non-contiguous canopies are safest from crown-fire spread, but do not provide the interlocking-crown habitat needed for nesting by Abert squirrels.

In summary, many factors need to be considered. The "clean" appearance of open savanna, mowed, or otherwise low fire-risk environment will favor some species but exclude many others. Diversity over the entire subdivision, which includes some brush piles, some doghair stands, snags, areas with unmowed grass, a variety of age classes and spatial arrangements of trees, and presence of shrubs, will provide the best wildlife habitat although some people may not approve of the "less neat" appearance of these areas.

With many individual landowners controlling vegetation on small acreages, the potential of remaking or removing wildlife habitat is great. The challenge is to create patterns where both people and wildlife can have homes.

FIRE RISK

Fire is a natural process associated with both grasslands and ponderosa pine forests. Fire occurs in various intensities, durations and frequencies. Fires range from cool surface fires of long or short duration to hot crown fires which may also be of long or short duration.

The former frequency, intensity or duration of either surface or crown fires in Black Forest is not known for certain, but research in other areas of the Front Range suggests that surface fires which thinned regenerating ponderosa pine trees occurred at least in 40-80 year intervals. Destructive crown fires were very infrequent.

Lightning (May to September), is the only natural ignition source for fire. Native Americans set fires for a variety of purposes in grasslands and low elevation forests

throughout the west, but the specific history and effects of fires set by Native Americans on Black Forest is not known.

The possibility of destructive crown fires is much greater now because of the change in forest structure to crowded closed canopy stands with many small trees and dead branches acting as ladder fuels. Human-caused ignitions can happen any time of the year. If ignition occurs during windy weather (especially November through February when snow is absent) there is potential for severe crown fire spread. Dry, windy spring weather can create dangerous conditions. Consider the May 18, 1996 fire on Buffalo Creek, Pike National Forest, caused from a campfire on a windy day.

Summer lightning in Black Forest is usually accompanied by rain, so dry lightning fires, while not impossible, are less likely here than in ponderosa pine forests farther north in Wyoming, Montana, Idaho or the Black Hills of South Dakota.

Cool, surface fires have been rapidly suppressed in Black Forest for well over 50 years, which has prevented some of the natural thinning of tree regeneration from fire. Where both overstory and understory trees have been thinned, and defensible space has been created around dwellings, a cool surface fire poses little threat to property values and creates only short-term nuisance from smoke, charcoal and a temporary setback to vegetation growth.

The risk of crown fire spread to Bent Tree is greatest along the western border of the subdivision near the Palmer Divide Ridge, where adjacent subdivisions downhill and downwind to the west and southwest have not been thinned. To the south, Higby Road affords little protection as a fuelbreak because of the large area of dense forest uphill and downwind to the south. Since prevailing winds in summer are from the south-southeast-southwest, this area is a potential fire spread danger zone (Figure 8).

Potential fire spread is greatest uphill and with wind. Patchier forest/meadow areas to the north of Bent Tree and the Highway 105 right-of-way affords some minimal

protection from crown fires spreading from the north where there is also a high probability of seasonal strong wind. There is a modest area of thick forests immediately to the east across Roller Coaster Road, but the proximity of open meadow in the broad expanse of Cherry Creek Valley and the rarity of easterly winds suggests that firespread from this direction is least likely.

NEIGHBORHOOD INVENTORY AND MANAGEMENT UNITS

Considerable variation of forest structure occurs within and among lots because of forest management activities since 1970 by the developer and more recent management activities by individual homeowners. Thus there will be exceptions to the patterns and generalizations of the inventory and management units presented below. With this limitation considered, Bent Tree I, II and III have been allocated into twelve inventory and management units that have many common features with regard to topography, thinning patterns and subsequent regeneration, forest/grassland mosaic characteristics, erosion risk, and crown fire risk (figure 9).

Bent Tree IV and V are allocated into two additional units which will not be considered now because they are still in development planning stages and thinning has not been completed.

Characteristics of each unit are presented in Table I. A list of individual lots per each unit is in Table 2.

Neighborhood inventory and management units for the Bent Tree Forest Stewardship Plan are identified initially by Subdivision Filing (I, II and III), and then by criteria of thinning pattern and regeneration, canopy density, dwarf mistletoe focal areas, slope and aspect differences, pattern of meadow or forest openings, and crown fire risk. Thinning patterns used for each subdivision filing facilitated this grouping because thinning patterns are distinctive and differ in age.

This method creates neighborhood areas, enabling landowners to work together on common problems in



Figure 8. Fire risk to Bent Tree from surrounding areas.

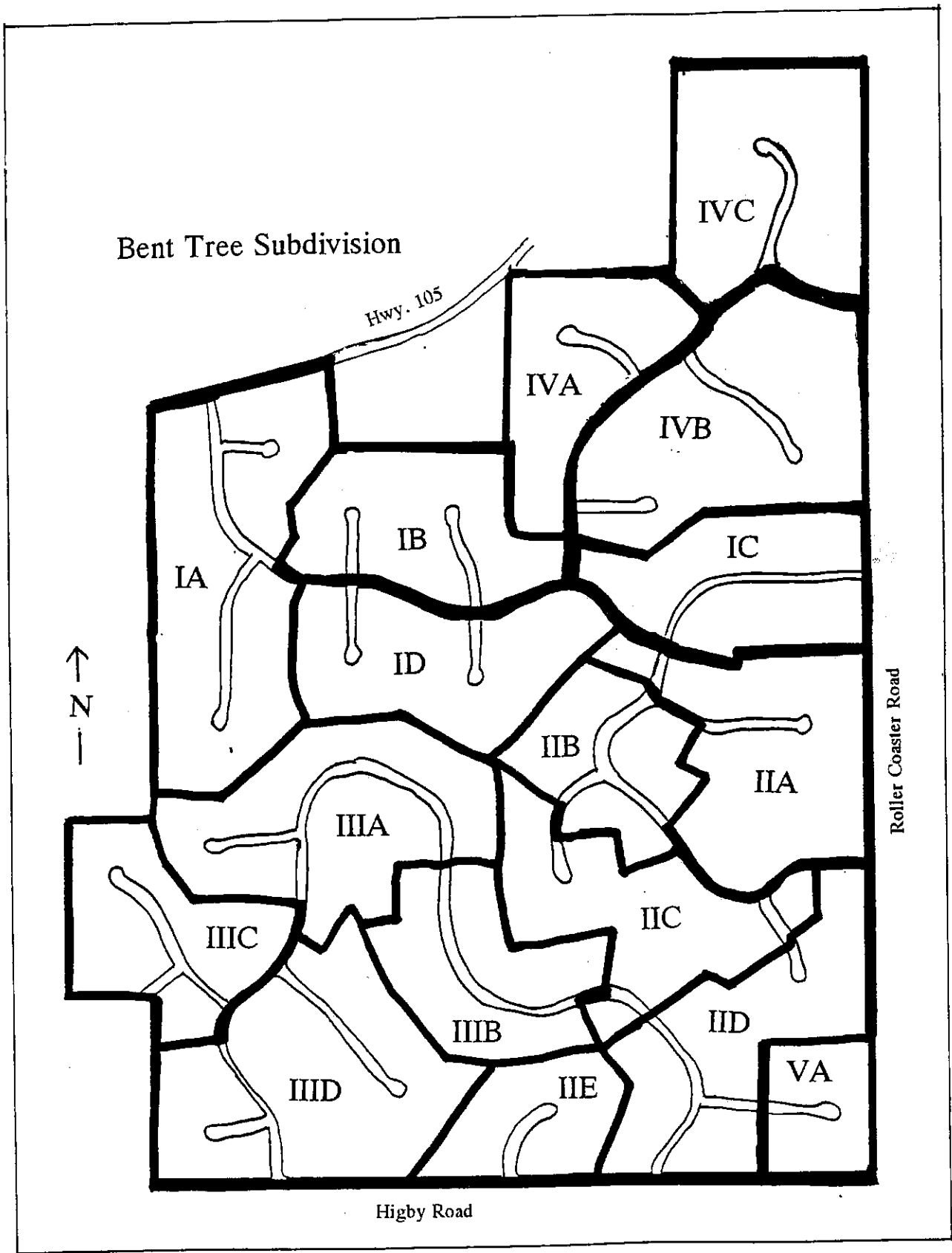


Figure 9. Neighborhood inventory and management units.

Table 1 INVENTORY AND MANAGEMENT UNITS

Bent Tree I

- IA Location - Scottswood Drive, Pebble Creek Court, Merryhill Court
Surface - nearly flat, south end of lots at end of Merryhill along ridgeline
Thinning - single canopy, widely spaced trees
 Many areas not thinned - crowns touching
Regeneration - clumps of small trees in canopy gaps
Meadows - none
Fire risk - high
 Heavily forested subdivisions downhill immediately to the west
 Lots along ridgeline exposed to firespread because of uphill position along the ridge
- IB Location - north of Scottswood Drive, north parts of Barrington Court and Radbourne Court
Surface - nearly flat
Thinning - single canopy, widely spaced trees
 Most areas thinned - crowns not touching
Regeneration - scattered small trees or clumps of small trees
Meadows - some natural openings; one small wet meadow area with pond
Fire risk - moderate
 Scottswood Drive provides a firebreak to south and southwest
 Better crown spacing than area IA. Few ladder fuels in most places
- IC Location - east of Queensmere and both sides of Charter Pines Drive
Surface - nearly flat
Thinning - small areas thinned to single canopy layer
 Much of the area in need of thinning
Regeneration - scattered
Meadows - some upland grassy openings along Charter Pines Drive
 Forest/grass mosaic offers increased management choices
Fire risk - moderate to high
 Depends on canopy closure and ladder fuels; some firebreak
 protection from Charter Pines Drive
- ID Location - south of Scottswood Drive, south ends of Barrington and Radbourne Courts
Surface - nearly flat, south end of lots along ridgeline
Thinning - mostly single canopy. Lots along southeast edge border on mistletoe sanitation area.
Regeneration - variable -scattered or clumpy young trees.
Meadows - a few grassy upland openings
Fire risk - moderate to high
 Thinning below the ridge in Bent Tree III affords some protection from uphill fire spread
 Risk from the west is high because of canopy density
-

Table 1 Continued

Bent Tree II

IIA	Location	- north of Charter Pines except for mistletoe clearcut area.
	Surface	- nearly flat
	Thinning	- mixed age and height; individual tree selection
	Regeneration	- variable
	Meadows	- Restricted to few small canopy gaps and mistletoe sanitation areas on west edge.
	Fire risk	- moderate to low Presence of thinned areas and roads and Bent Tree III to southwest, meadows to south and southeast and mistletoe sanitation area to northwest reduce the chances of firespread
IIB	Location	- near highest point west of Charter Pines Drive. Mistletoe sanitation area
	Surface	- nearly flat
	Thinning	- clearcut for mistletoe sanitation. Some pockets of mistletoe remain along the edges
	Regeneration	- sparse. Area was disturbed from tree removal and regeneration has been slow, partly because of climatic conditions in the past 15 years.
	Meadows	- upland meadows created by canopy removal
	Fire risk	- low
IIC	Location	- south of Charter Pines except for mistletoe clearcut area.
	Surface	- nearly flat
	Thinning	- mixed age and height; individual tree selection
	Regeneration	- variable
	Meadows	- Restricted to small canopy gaps and mistletoe sanitation areas on east edge
	Fire risk	- moderate Presence of thinned areas and roads in Bent Tree III to southwest and mistletoe sanitation area to northwest reduce the chances of firespread; uphill topographic position increases risk
IID	Location	- Southeastern corner of Bent Tree subdivision; end of Regal Court; east end of Colonial Park
	Surface	- nearly flat to slightly rolling
	Thinning	- mixed age and height; individual tree selection
	Regeneration	- small trees, mostly well-spaced, limby, in upland meadows
	Meadows	- forest edge/upland meadow border (soil difference)
	Fire risk	- low
IIE	Location	- Off Higby Road on either side of Viscount Way
	Surface	- Erodible side valley south Palmer Divide Ridge
	Regeneration	- mostly small trees on thin soils
	Meadows	- none
	Fire risk	- moderate high because of dense forest to the south

Table 1 Concluded

Bent Tree III

- IIIA Location - Edenhurst Drive and loop in midsection of Colonial Park Drive
Surface - moderate to steep slopes with benches and deep swales.
Slope aspect mostly southwest to northwest around drainage.
Thinning - strip cut and individual tree selection oriented SW to NE in parallel openings. Some areas of dwarf mistletoe buffering. Many trees of small stature and small diameter because of thin soils and xeric slope exposure.
Regeneration - sparse
Meadows - none
Fire risk - low
- IIIB Location - either side of lowest portion of Colonial Park Drive
Surface - moderate to steep slopes
Thinning - strip cut and individual tree selection oriented SW to NE in parallel openings. Some areas of dwarf mistletoe buffering. Many trees of small stature and small diameter because of thin soils and xeric slope exposure.
Regeneration - sparse
Fire risk - low to moderate
Disturbed areas in IIID provide fuelbreak
- IIIC Location - Cambrook Court
Surface - Steep south or southwest facing slopes except for flatter area near the top of Cambrook Court
Thinning - strip cut and individual tree selection oriented SW to NE in parallel openings. Some small clearcuts. Many trees of small stature and small diameter because of thin soils and xeric slope exposure.
Regeneration - sparse
Meadows - none
Fire risk - low to high
low from south, moderate from west, high from north because of presence of other subdivision, dense forest and topography
- IIID Location - Scarsbrook, Brenthaven and southern end of Colonial Park Drive.
Surface - steep slopes with mostly northwest orientation; most severe erosion area in Bent Tree; two large areas of surface disturbance; drainage easement to adjacent property.
Thinning - strip cut and individual tree selection oriented SW to NE in parallel openings. Some small clearcuts.
Regeneration - sparse due to recent disturbance
Meadows - small wet meadow area in drainage easement
Fire risk - low to high
Fire risk within IIID is low, but risk from fire spread from the thick forest to the south of Higby Road is high. Disturbed areas provide fuelbreak.
-

Table 2. List of lots in each Neighborhood Inventory and Management Unit.

Subdivision Area	Lots	Total lots	Approx acres
IA	1-15; 58-63	21	53
IB	44-57	14	35
IC	31-43	13	33
ID	16-29	14	35
IIA	30; 64-73; 77-82	17	43
IIB	74-76; 94-95; 102-105	9	23
IIC	84; 90-93; 96-101; 117-119	14	35
IID	83, 85-89, 113-116, 120-124	15	38
IIE	106-112	7	18
IIIA	131-144; 182-188	21	53
IIIB	125-139; 189-196	14	35
IIIC	145-158	14	35
IIID	159-180	23	58
IVA	197-210	14	35
IVB	226-251	26	60
IVC	211-225	15	40
VA	216-221	6	15
		SUM 258	744 ac

their immediate areas as well providing opportunity to coordinate with adjacent subdivisions plan.

IV. PRESCRIPTIONS

Prescriptions are designed to assist planning and management within lots, and among lots and neighborhood inventory and management units. Because the environment is three-dimensional, with certain characteristics in the vertical dimension and others in the horizontal dimension, use of prescriptions provides a way for individual landowners, or landowner groups, to identify and design ways to improve fire safety, wildlife habitat, aesthetic and an ecosystem productivity.

Limitations of choices are imposed by the present structure of the vegetation, soils, slope and aspect of individual properties, and landowner values and objectives. Prescriptions are based on general forest structure and successional processes with attributes identified for characteristics of fire safety, wildlife habitat, visual impact, erosion risks, and the flow of biomass into sustainable forest products including firewood and transplant trees.

No action is also a management prescription and homeowners need to balance the costs and benefits of proactive forest management with the no action alternative.

VERTICAL FOREST STRUCTURE

Thinning strategies of the past few decades fall into two categories: 1) production of single canopy layers because removal of trees resulted in tall and well spaced overstory trees with few understory trees (Bent Tree I) and, 2) multiple canopy layer stands of mixed ages and heights accomplished by individual tree selection (Bent Tree II and III).

Single canopy layer prescription

A single canopy layer (also called even-aged management) makes a forest safer for cool surface fires, retards crown

to crown fire spread, reduces risk of mountain pine beetle growth, and encourages grass and forb development in the understory. The rate of renewed tree growth and development of understory plants depends on how much the trees are thinned, soil properties, slope and aspect. The growth of trees is in part directly proportional to the amount of thinning: i.e. more generous spacing will encourage faster tree growth.

Typically, thick groups of ponderosa pine seedlings will develop in 10-15 years under thinned stands. If seedlings are regularly removed, open, single storied forest will be perpetuated for a century or more. As crowns expand, the canopy will close and it will be necessary to remove additional large trees to maintain canopy gaps.

Removal of regeneration and further thinning of larger trees to maintain canopy gaps and understory vegetation are common situations in Bent Tree I and II. Single canopy layer vertical structure can be composed of trees of widely varied ages if older and younger mature trees are retained in different patches.

The single canopy pattern can be allocated into a matrix of fairly evenly spaced individual trees, or trees of similar height can be grouped into patches of desired area. Intervening areas can be open or have trees with other structural characteristics.

Retention of selected individual younger trees of various sizes and ages will convert a single canopy layer stand into a mixed age/mixed height stand over a period of 20-50 years.

Multiple canopy layer prescription

Mixed ages and heights which create multiple canopy layers in a forest is also called uneven aged management (Figure 7e). This is accomplished by selecting individual trees in a variety of height and age classes for removal or retention. Uneven age/height stands offer more habitat diversity for birds and wildlife and many people perceive this a being more "natural" and less "managed" looking forest than even age/height forests. Spacing can be either random or clumped.

On an individual lot trees could be grouped by different size/age classes (i.e. areas of seedlings, of saplings, of pole size and of mature trees), they could be distributed fairly evenly forming a matrix of mixed ages and sizes, or they could be clustered in mixed groups of varying composition.

Considerations for these choices include awareness of ladder fuel possibilities and therefore the proximity of small and medium sized trees to large trees and placement of specific age groups in various topographic positions such as ridges or swales. Need for thinning increases as the trees grow. Thinning may include removing the young trees and allowing overstory to develop, or by removing the larger trees and retaining smaller age/size classes.

Doghair prescription

In doghair stands, both height and diameter growth is suppressed. Cross sections of trunks show closely spaced tree rings. Trees can persist in this type of situation for long periods of time (5-30 or more years). This permits use of crowded stands as a visual screen or tall hedge.

Where retention of doghair stands results in tolerable fuel loading, manipulation of crowded stands may serve a useful landscape purpose. Doghair stands can serve as snowfences or screens. Retention of suppressed trees may be appropriate for provision of dense cover for wildlife habitat. If doghair stands are below large trees they pose a ladder fuel hazard and if adjacent to roads, they lessen the value of the road as a fuelbreak. Doghair stands are susceptible to bending and breaking from snowstorms and eventually have to be removed.

HORIZONTAL FOREST STRUCTURE

Many satisfactory possibilities exist for manipulating elements of the present forest mosaic (Figure 10a). Manipulation of both mature trees and regeneration constrains choices in the future.

Some general patterns for horizontal forest structure prescriptions are presented in Figures 10b-10e. There are

many variations of these basic patterns. These patterns might be applied to an entire lot or to a portion of a lot. They could also be expanded in scale for a group of lots if, for example, a group of homeowners was particularly interested in fire protection, a specific kind of wildlife habitat or a specific visual character. Any of the vertical structure arrangements can be integrated into the horizontal patterns.

Random tree distribution (Figures 10b and 10d)

This creates an open savanna pattern if trees are thinned far enough apart so that crowns do not touch. The open savanna provides good visibility for viewing wildlife but less screening for privacy. It provides the least cover for coyotes and foxes, but the best hunting conditions for owls and forest hawks.

Understory development is fairly even under randomly spaced trees. Snow drifting, snow retention and light availability is more uniform than if trees are grouped into patches.

Clumped tree distribution (Figure 10c)

The patchier environment provided by this pattern includes areas of denser forested patches interspersed with openings. Snow drifting, snowmelt, shading and light availability are more variable and a different suite of understory plants can be expected when compared to a savanna.

This pattern is useful in conjunction with shrub plantings to provide more varied habitat than randomly spaced trees. This pattern is also appropriate when the intent is to create openings in a closed forest.

Combined random and clumped distribution (Fig. 10e)

This pattern usually characterizes larger areas and provides maximum forest structure and habitat diversity. A combination of random distribution and clumped distribution prescriptions is very useful for creating forest diversity at the scale of a lot or group of lots (Figure

10e). It is a good way to accommodate soil variations and topographic considerations.

V. MANAGEMENT CONSIDERATIONS

OVERSTORY DIVERSITY

The dominant native conifer in Bent Tree is ponderosa pine. Douglas-fir was probably sparingly present historically. Common juniper is an occasional understory shrub. Aspen is present now and was likely present historically. Of these species, ponderosa pine and aspen are adapted to fire, one by fire resistance of mature trees and the other through its ability to resprout after fire.

Coniferous species

Other coniferous species will grow in Bent Tree. If additional species are planted, the botanical integrity of the ecosystem should be considered, as well as the physical characteristics of the trees, their climate hardiness and their tendency to create ladder fuels.

Engelmann spruce, blue spruce, Douglas fir, white fir and pinyon pine do not naturally prune lower branches like ponderosa pine and therefore can become serious ladder fuels. This is an important consideration for ornamental plantings near dwellings. Spruce and fir trees can attain gigantic size and pose significant fuel sources when mature.

Most deciduous trees will have difficulty surviving the Palmer Divide climate because of occasional very low winter temperatures, late spring snowstorms, and spring freezes. Among choices for native deciduous species, aspen and green ash are probably the best.

UNDERSTORY DIVERSITY

Forest understory diversity is directly affected by the degree of canopy closure and tree spacing, type of soil and presence of slopes. The least diverse areas are on south-facing hillsides with Quaternary alluvium while

more diverse areas are either flat or gently rolling with a savanna or clumped pattern.

Major understory species include kinnikinnik, an evergreen plant of the heath family, especially abundant on thin soils; sedges (grasslike plants with leaves triangular at least at the base); and grasses. Mountain muhly, junegrass, king spikefescue and timber oatgrass are fine-leaved bunchgrasses characteristic of ponderosa pine understories.

Historically, grasses and forbs formed a fairly sparse cover under the pine trees, providing somewhat discontinuous light fuels. The recent invasion of smooth brome (*Bromus inermis*), a tall, leafy exotic pasture grass, has the potential for affecting the characteristics of surface fire spread in ponderosa pine forests. Smooth brome is usually found in meadows, but will grow in the timber, particularly on deeper soils north of the ridge. It is an aggressive, rhizomatous grass that spreads by seeds, as well as from underground roots. Repeated mowing will help control this grass, or it can be killed with herbicide.

Mowing and irrigating affect understory diversity. Mowing, like grazing and fire, is a form of disturbance by defoliation. Disturbances from grazing and fire were historically present. These disturbances removed or weakened grasses and allowed wildflowers or small shrubs to colonize some areas. These disturbances were patchy in size and occasional in time, providing a variety of conditions for different kinds of plants to survive.

Modern practices of frequent irrigation, repeated mowing and fertilization affect not only species composition (i.e. replacement of numerous native species by fewer species including Kentucky bluegrass, white clover and dandelions), but also change the competition and disturbance framework.

Constant irrigating and/or mowing tends to favor disturbance-adapted species such as Kentucky bluegrass, dandelions and various annual weeds. Mowing once or twice, after mid-July to reduce fire hazard, after most early-blooming species have set seed and while most late-

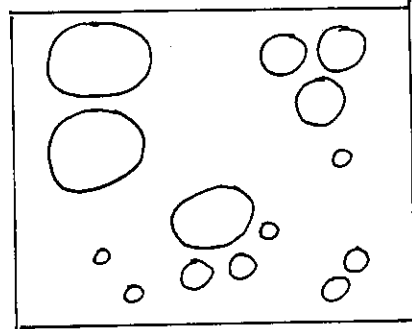
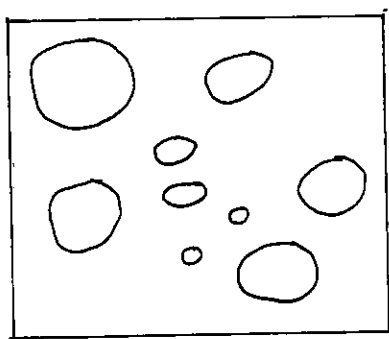
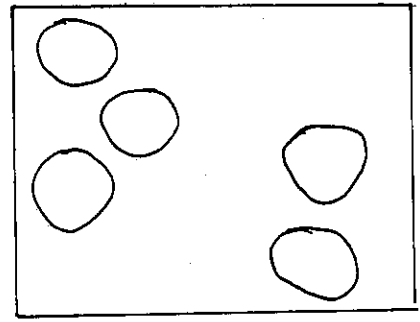
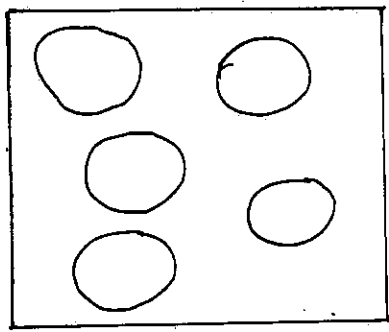
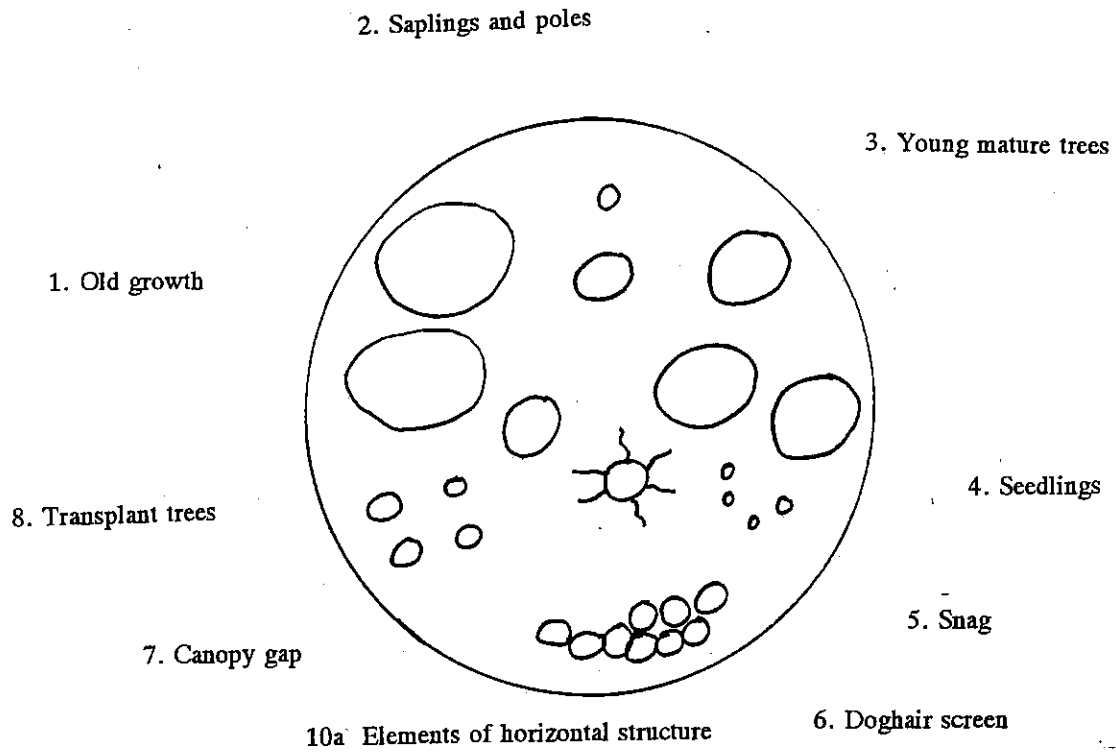


Figure 10. Horizontal forest structure.

summer blooming species are actively growing, will better perpetuate perennial native plants.

Recommendations for plant materials in this Forestry Stewardship Plan emphasize use of mainly native species (Appendix 5). The few adapted species on the lists are not invasive. Use of invasive non-native grasses, and trees or shrubs from Europe or Asia (for example Russian olive, Siberian peashrub) are not recommended.

NOXIOUS WEEDS AND INVASIVE EXOTIC PLANTS

The Palmer Divide has few serious weed problems compared to lowland areas. Musk thistle and Canada thistle are occasional, but can be controlled with mechanical and chemical methods (See Appendix 4). Both thistle species occur in Bent Tree, mostly in the Bent Tree III area. It is important to consistently to apply control measures each year before seeds form and disperse.

Diffuse and spotted knapweed are presently uncommon in timbered areas. A serious infestation of knapweed is in the meadow at the southwest corner of Bent Tree III at the end of Brenthaven. Knapweed tends to build up a large seedbank in the soil and may take several years to eradicate, even if seed sources are killed or removed annually.

Annual weed populations may become very high on disturbed areas around new construction, and especially on leach fields. The best treatment is to encourage germination of the seedbank followed by cultivation and planting to perennial grasses. The germination and cultivation steps may need to be repeated several times during a growing season with perennial grasses sown in the fall. Mechanical removal, while not a glamorous solution, is effective and avoids the use of herbicides.

Suitable grass species include western, thickspike and slender wheatgrass, Chewings fescue, creeping fescue, Arizona fescue and annual ryegrass. Do not use smooth brome, orchard grass or crested wheatgrass. These three

species are not native and tend to either be invasive or prevent establishment of small-stature native perennials. Alfalfa and yellow sweetclover are also not recommended because of their large size and contribution to fuel loads. Kentucky bluegrass is usually in commercial seed mixes although it is not a species of choice for native grass plantings.

TOPOGRAPHIC CONSIDERATIONS

Wind, snow drifting, storm runoff, erosion, fire risk and behavior, and difficulty of revegetation are all affected by topographic pattern. Choices size, shape, density and rooting characteristics of vegetation can amplify or mitigate these environmental factors.

Microclimate characteristics of hot, dry south and west-facing slopes or cold and wetter north and east-facing slopes can be amplified by tree canopy closure. Snow is retained longer when canopies are closed but melts away quickly when canopies are opened. Interception of heavy rainfall reduces erosion where canopies are denser. Since fire spread is greater on slopes than on flat areas, this must also be taken into consideration when choosing canopy density.

South and west-facing steep slopes lacking soil are difficult environments for growth of all plants and special care should be given to avoid soil disturbance in these situations. Soil and parent material erosion off slope crests and sides, and soil accumulation in low areas, amplifies the difficulties presented by heat and dryness. Thus, special measures using mulch, barriers, and other protective devices may be necessary to establish trees or grasses.

The concepts of forest vertical and horizontal structure (figures 5-7) in the forest mosaic are most easily applicable to flat or gently rolling surfaces such as those found in most of Bent Tree I and II. The dissected slopes of Bent Tree III, which have radically different directional exposures (north and east vs south and west), impose extra constraints.

Some lots in Bent Tree III offer topographic diversity, but also have problems with soil erosion and stunted trees. For these areas, advantage can be taken of benches in the slopes for establishing and growing larger trees. Swales may offer sites for placement of thicker groups of trees or shrubs to taken advantage of moisture and slow the downslope movement of soil and parent material. Denser spacing on south facing slopes offers extra shade to the ground, helping to conserve evaporative moisture. Tree roots help hold soil in place.

On north-facing slopes, more open forest will allow earlier melting of snow. Grasses are easier to establish on north-facing slopes and will tend to form thicker cover.

Doghair stands can serve as effective snowfence, cause drifts to form on the lee side. All trees can shade the ground north of tree groups, holding snow. This is an important consideration for choices of tree placement or retention near dwellings and along driveways.

WILDLIFE HABITAT

Planting of aspen and shrubs, particularly mountain mahogany, and placement of salt blocks are attractive to deer. Many species of birds associate with ponderosa pine forest. Some are winter or summer residents and others are migratory. Birds can be attracted to viewing areas by provision of water, seed or suet.

Snags

Although dead trees may seem undesirable or give the impression of an unhealthy forest, retention of large, dead tree snags provides good habitat for cavity-nesting bird species and small mammals. Snags are most desirable for wildlife after they have begun to develop soft cores and are not particularly suitable for firewood. Snags adjacent to openings are especially attractive to hawks and owls for hunting and perching. Dead trees should be retained unless they were killed by mountain pine beetle infestation.

Snag prescription - A recommended level of snags is a minimum of one to three snags per 5 to 10 acres. Snags can be randomly distributed or clustered. Do not create or retain snags where they can fall on buildings or vehicles. Snag retention provides opportunities for neighbors to cooperate to provide wildlife habitat.

FIRE RISK MITIGATION

Landowners must make choices weighing fire risk and other values. For example defensible space around dwellings minimizes presence of trees, but trees provide shade and beauty near a house; thick groves of trees are more hazardous for fire, but provide cover for small mammals which many homeowners enjoy viewing. A savanna pattern is safer for fire, but may eliminate some wildlife habitat values and may not provide levels of closure and privacy desired by a homeowner.

Bent Tree is within the Tri-Lakes Fire Protection District. Nearby cooperating Fire Districts include Woodmoor-Monument, Donald Wescott, Palmer Lake and Black Forest. From late May to September or early October, a United States Forest Service 20-person Hotshot Team and fire-fighting helicopter are based at the Monument Service Center southwest of Monument. The Hotshot Team is often away in late summer, fighting fires in other area.

Two fire fighting centers are located near Bent Tree. An unmanned station with a pumper (approximately 500 gallon capacity), ambulance and water tanker (1000 gallon capacity) is located at the corner of Roller Coaster Road and Highway 105. The main station is located on Highway 105 between the towns of Monument and Palmer Lake. This station has two engines with 1500 gallon tanks, two ambulances and a wildland fire-fighting truck (4-wheel drive).

A broadscale Fire Risk Hazard and Value map is being developed for Teller, Douglas and El Paso Counties by an interagency team under the auspices of Pikes Peak Wildfire Prevention Partners. This effort is designed to show coincidence of high value structures and high wildfire-risk areas in the three counties. On this scale,

wildfire mitigation measures include provision of adequate bridges and roads, location of natural and manmade fuelbreaks, water availability from lakes, ponds, storage tanks and hydrants, clear property identification and treatment of vegetation to reduce wildland fire spread.

Do not assume that your home will automatically be a priority for protection in case of wildfire. The fire-fighting organizations use a decision-making tool called "Triage", which means "to sort" when considering action. The bottom line is how much risk and effort it takes to defend a given property and structure within the context of nearby fuel loading, defensible space and a particular fire situation (size, winds, temperatures).

Eventually all El Paso County properties will be classed according to risk hazard and value. A property-owner can greatly improve the chances of successful fire defense if there is defensible space around the dwelling and the overall property is well-managed for fuel amounts and contiguity.

The best defense against spread of catastrophic wildland fire is proper treatment of fuel loading and fuel contiguity in forests and grasslands.

Many excellent publications are available to guide homeowners in decreasing risk to both dwellings and land from fire loss. Service in Action pamphlets from Colorado State University Extension Service are prepared especially for Colorado. The Pikes Peak Wildfire Prevention Partners has prepared a list of ten guidelines for creating defensible space around dwellings (Table 3).

Guidelines adopted by the City of Colorado Springs for fuels management in suburban areas at the Wildland/Urban interface are useful for all rural residential homeowners. These guidelines will protect structures from wildland fires and also protect the forest from fires originating in structures.

Fuels management guidelines include creation of a fuels management safety zone within at least thirty feet of dwellings. For houses on slopes, the fuels management

zone is larger (Figure 11). Homes in coves of hills are a more risk than homes on ridges.

The defensible space fuels management zone includes pruning of dead limbs to ten feet above the ground, removal of all limbs over or under roof eaves and within fifteen feet of a wood-burning stove or fireplace chimney, thinning of large trees so that canopy limbs do not overlap, and limitations on size and spacing of shrub patches.

Shrub patches are recommended to be less than 100 square feet in area, at least ten feet apart, separated by mowed grass and at least ten feet from the building. Homeowners are encouraged to place irrigated areas near the house or use non-combustible materials such as gravel or paving.

Regular removal of pine cones and pine needles from gutters and choice of roofing materials are important to protecting dwellings from fire. Non-combustible or fire-resistant roofing materials are best since roofs are especially likely to catch fire from wind-blown firebrands.

Firewood should be stacked uphill, at least fifteen feet from the house and away from trees.

Landscape level fuel management on individual lots through branch pruning, tree thinning, removal of ladder fuels and mowing of dense stands of tall grasses significantly improves area-wide fire safety.

Between 80 and 90 percent of wildfires in Colorado are man-caused (Fahenstock 1971). Rate of fire spread approximately doubles from level ground to a 30 per cent slope. This is an important consideration for homeowners on the sloping south side of the Palmer Divide in Bent Tree.

Landscape management recommendations specific to Bent Tree Subdivision are in Table 4.

Table 3. Guidelines for creating defensible space. (Pikes Peak Wildfire Prevention Partners - call El Paso County Office of Emergency Management, (719) 575-8590, for additional information).

1. Thin continuous tree and brush cover within 30 feet of your home.

In the 30 foot "defensible space," adequate thinning is reached when the outer edge of tree crowns are at least 10-12 feet apart.

Occasional clumps of 2-3 trees are acceptable if more space surrounds them.

Small patches of brush or shrubs may be left if they are separated by at least 10 feet of irrigated grass or noncombustible material.

If the home is located on the crest of a steep hill, thin fuels at least 100 feet below the crest.

2. Dispose of all slash and debris left from thinning.
 3. Remove dead limbs, leaves and other ground litter within the defensible space.
 4. Stack firewood uphill and at least 15 feet from your home.
 5. Maintain an irrigated greenbelt immediately around your home using grass, flower gardens, fire resistant plantings, rock or other non-combustible material. Avoid bark or wood chip mulch in this area.
 6. Mow dry grasses and weeds to a height of 2 inches or less and keep well-watered, especially during periods of high fire danger.
 7. Prune branches from trees within the defensible space to a minimum of 6-10 feet above the ground. Also remove shrubs, small trees or other potential "ladder fuels" from beneath large trees; left in place, these can carry a ground fire into the tree crown.
 8. Trim branches which extend over the eaves of your roof. Remove branches within 15 feet of a chimney.
 9. Clean roof and gutters of pine needles and leaves to eliminate a fuel source for firebrands.
 10. Reduce density of surrounding forest at least 100 feet out from the homesite (it is preferable to thin your entire lot). Thin tree crowns so they do not touch each other.
-

Table 4. Landscape management tips for Bent Tree subdivision

- Learn to recognize Canada thistle, musk thistle and knapweed species. Remove populations of these plants annually before they go to seed.
 - Prune lower tree limbs to a height of at least six feet. Ten feet is better. This decreases ladder fuel loads, opens views and makes the forest safer for walking.
 - Thin trees while they are small. There is less slash to dispose of and it is less work.
 - Remove tree regeneration from view strips. Keep all trees below a height that retains views.
 - For trees less than 15 feet high, a good rule is to have a distance between trees equal to the height of the tallest neighbor. Thus, a clump of four foot trees should have at least four feet between individuals and a clump of eight foot trees should have at least eight feet between them. A four foot tree and an eight foot tree should be eight feet apart. All small trees should be at least fifteen feet from larger trees. This practice eliminates ladder fuels beneath large trees and promotes a decrease in tree population as size increases.
 - For minimal firespread large trees should ideally be 10 to 20 or more feet apart to minimize crown contiguity, but remember that interlocking crowns in some clumps of large trees are important for Abert squirrel nesting habitat and also provide cover for birds.
 - If your property contains mainly large trees, create canopy gaps by removing the large trees and allow younger trees to grow to diversify the age structure.
 - Some doghair clumps may be desirable for wildlife habitat or screening. Swales and ridges may be good places for these. For fire safety it is best to retain thick clumps of trees near openings and away from other trees.
 - Remove pine needles by raking at least 30 feet back from all structures.
 - Access for fire equipment. Evaluate whether a fire truck can get into a forested area, especially where trees are thickest, areas where fire is most likely to approach or between forested areas and dwellings on hillslopes. The western boundary of Bent Tree I and III with Arrowwood and the Palmer Divide ridgeline which separates dome lots in Bent Tree I from Bent Tree III are two areas where thinning trees near property boundaries, to permit fire-fighting access, might be especially useful.
 - Emergency escape routes. If a fire was approaching down your street, do you have another route on which you could drive your vehicle to get to another road for escape? This is an excellent area for neighborhood cooperation and planning.
-

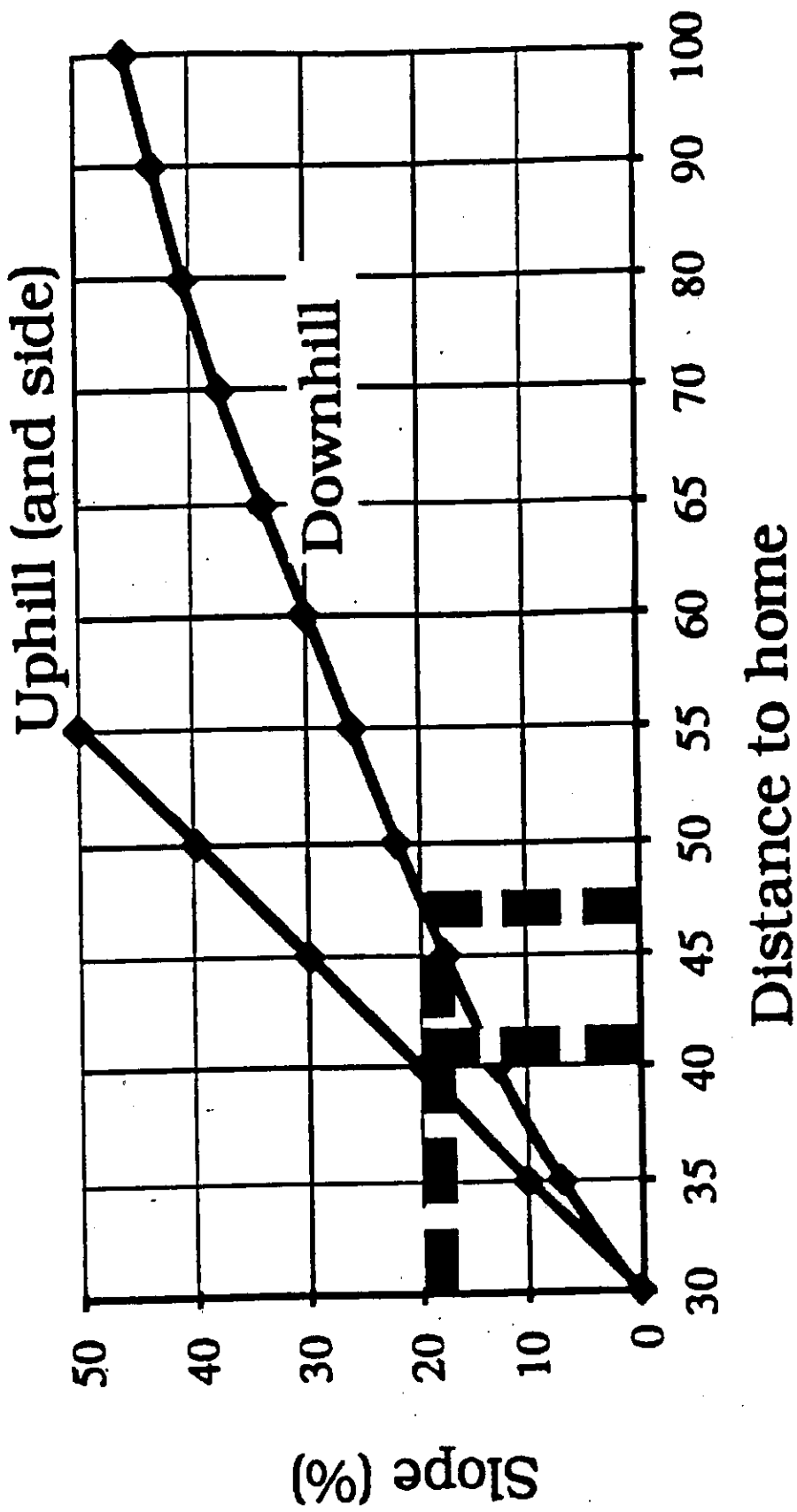


Figure 11. Slope and defensible space dimensions (from Dennis, F.C. 1992).

VI. MANAGEMENT RECOMMENDATIONS

ENVIRONMENT AND FUELS MANAGEMENT

Noxious weed and exotic plant control

1. Eradication of musk thistle and Canada thistle, could be accomplished in one to three years through a combination of mechanical control and chemical control measures by individual homeowners or weed control contractors.

Musk thistle (*Carduus nutans*) - mechanically remove individual plants by pruning or hoeing before seed sets at the beginning of August. Dispose of plants in plastic sacks sent to the landfill. Musk thistle occurs in small patches, often over leach fields. Populations, mostly in Bent Tree III, are presently small and well defined.

Canada thistle (*Cirsium arvense*)- mechanically remove small patches by mowing in June and July before flowers form. Spray these mowed and weakened patches in late July. Canada thistle occurs in moist sites with better soils, usually in swales or road ditches. A large patch is in the small valley at the lowest area on the south side of Colonial Park Drive below the dead wildlife trees in Bent Tree III. This area should be sprayed by a professional weed service for control in 1998. Other patches are smaller and can be eliminated by homeowners.

2. First containment, then eradication of diffuse and spotted knapweed (*Centaurea diffusa* and *Centaurea maculosa*). Populations of knapweed are highly localized. A small population is along Roller Coaster Road north of the fires station driveway, and the other is a large infestation in the meadows along Brenthaven in Bent Tree III. The population on Roller Coaster Road could be eradicated by pulling up or hoeing individual plants, and disposing of them by sacking in plastic sacks and removing to a sanitary landfill. The area at the end of Brenthaven involves several lots and should be

sprayed by a professional weed service for several years until eliminated.

3. populations of mullen (*Verbascum thapsus*) are very high in some disturbed roadside areas of Bent Tree III, and in small patches of disturbed areas of view strips. Mullen is not a noxious weed, but it is not a native plant. Populations can be decreased by removing rosettes to prevent seed formation in subsequent year. The disturbed sites can be seeded with native grasses.
4. Smooth brome (*Bromus inermis*) was likely planted as a pasture grass in West Cherry Creek valley during the past century. This robust grass has become a dominant on meadows especially along the east end of Colonial Park Drive. Unmowed smooth brome is a late summer/fall fire hazard. Brome also competes severely with smaller grasses and forbs and decreases the biological diversity of a site. Most homeowners cope with brome by mowing large areas repeatedly.

Brome is difficult to eliminate, but can be weakened by repeated mowing. If mowing is carefully timed, seed formation can be prevented, food reserves in brome roots can be depleted and other species which contribute less fuel biomass can be encouraged. Where small patches of brome are beginning to invade timbered areas, the grass can be pulled out or sprayed with a double concentration of a broad-leaved weed herbicide.

Fuels management

1. Thin the overstory to reduce canopy fuel contiguity
2. Selectively thin the understory and prune lower branches from tree trunks to decrease ladder fuels and improve growth and health of younger trees
3. Pay particular attention to keeping views open in strips cleared for views in Bent Tree III.
4. Carefully consider fire characteristics of conifers other than ponderosa pine for understory or ornamental plantings.
5. Mow to reduce fire hazard near buildings.

6. Mow native vegetation after mid-July if possible, to retain vigor of native perennial vegetation. Avoid bush-hogging large areas as this encourages weeds and discourages well-adapted native vegetation.
7. Rake and remove thick accumulations of pine needles so that grasses and forbs can grow.
8. Use grass seed mixes with small stature native grasses.

Erosion control

1. Increased erosion is likely from trail construction on segments of the new Bent Tree perimeter trail along Higby Road. The trail has been cut through hillslopes and goes directly up the fall line in places. Erosion is likely on the the cut-banks and on the trail tread where it conducts water down the hill.

Mitigation measures include:

- a. placement of water bars across the trail on slopes
- b. placement of mulch (available from the Slash\Mulch site in Black Forest) on the trail
- c. Mulching cut banks or rip-rapping with rock.

Wildlife habitat, educational and community actions

1. Consider what kinds of wildlife may occupy intentionally and unintentionally created habitat.
2. Design landscaping which avoids provision of habitat for undesirable wildlife species
3. Form neighborhood groups to decide on overall landscape patterns within sub-areas of Bent Tree. Opportunities are very limited for individual landowners to provide meaningful wildlife habitat, but more options are available if landowners manage larger areas as a group.
4. Work with adjacent subdivisions and homeowners groups to organize a slash/mulch program in the Woodmoor/Monument area.
5. Educate developers and homeowners of adjacent lands in the merits of good land stewardship which enhances environmental health and improves property values.

Management for ecological integrity

1. Encourage landowners to maintain mowed areas for fuelbreaks in the defensible space around dwellings, but to decrease the frequency of mowing, time mowing to prevent flower and seed formation of smooth brome (but encourage growth and seed formation of wildflowers and native grasses), and increase the height of mowed areas beyond the fuelbreak zone. Zoning of mowed areas might include leaving some areas unmowed or at least infrequently mowed near property boundaries. This is one way that adjacent landowners could cooperate to diversify wildlife habitat.

Because smooth brome grows most vigorously in May and June, it could be cut low during May, higher in mid to late June and cut again in mid to late July before seed forms. Deferring mowing until after the growing season in the fall will permit other species to complete their cycles and compete more successfully with smooth brome.

DEFENSIBLE SPACE AROUND STRUCTURES

1. Remove pine needles and pine cones from roofs and gutters.
2. Remove limbs which touch roofs or eaves.
3. Create a cleared area at least 15 feet in diameter around chimneys.
4. Create defensible space at least 30 feet out from each wall of buildings. This space has a break in surface fuel contiguity and amount/ This is accomplished by mowing, raking, pruning of lower tree limbs, generous spacing of shrubbery, placement of firewood away from house walls and use of low fire-risk landscaping materials. Low fire-risk landscaping materials include rock, stone, brick, gravel, and plants which do not have a lot of flammable biomass. High fire-risk materials include unmowed tall grasses, large, closely spaced patches of tall leafy shrubs, and large conifers (such as spruce trees) which have continuous fuels to ground level.

FIRE FIGHTING ACCESS AND ESCAPE ROUTES

1. Build pull-through driveways or driveways with a turn-around loop
2. Clear marking of addresses at the driveway entrance
3. Create fire access, and emergency escape routes suitable for vehicular access through timbered areas at rear lot lines not near roads.
4. Provide local fire organizations with a map of formal fire access and emergency escape routes.

FIRE RESISTANT CONSTRUCTION MATERIALS

1. Eliminate cedar shake roofing (item E: 6 of the Declaration of Protective Covenants) as a choice for roofing materials. Treated cedar shakes are safer than untreated shakes, but neither are good choices from the perspective of fire safety in a coniferous forest.
2. Existing cedar shake shingle roofs should be eliminated as roofs are replaced over time.
3. Use of stone, stucco or brick exteriors should be encouraged as these are the most fire resistant materials. Homeowners with wood siding should be encouraged to treat the exterior with a fire-resistant coating.

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APPENDIX 1 LEGAL DESCRIPTIONS

Bent Tree Filing I

That portion of Section 17, Township 11 South, Range 66 West of the 6th P.M., El Paso County, Colorado, more particularly described as follows: Commencing at the Northeast corner of said Section 17; Thence S 00°07'15" E)all bearings used in this description are relative to the East line of said Section 17, which was assumed to be S 00°07'15"E) on said East line, 3127.90 feet; thence S 89°52'45" W. 30.00 feet to a point on a line being 30.00 feet westerly of an parallel with said East line and the point of beginning; thence S 00°07'15" E on said parallel line, 1025.00 feet; thence S 89°52'45" W, 855.00 feet; thence S 83°00'00" W., 79.56 feet; thence S 25°00'00" W, 128.45 feet; thence N 77°18'00" W, 479.98 feet; thence S 12°44'00" W, 107.44 feet; thence on the arc of a curve to the right having a central angle of 09°00'00", a radius of 950.00 feet and arc length of 149.23 feet; thence N 68°18'00" W on a non-tangent line to said curve, 576.58 feet; thence S 48°27'34" W, 312.83 feet; thence S 38°41'00"W, 439.26 feet thence S 51°00'00" W. 225 feet; thence S 90°00'00" W, 98.00 feet; thence N 61°05'00" W, 595.30 feet; thence S 86°31'00" W, 740.00 feet; thence S 47°40'00", 805.92 feet; thence S 90°00'00" W, 525.00 feet to a point on the West line of said Section 17, said line also being the East line of Arrowwood Subdivision Filing No. 2 as recorded in Plat Book A-2 at Page 66 of the records of said county; thence N 00°19'30" W on said line, 255.65 feet to the West quarter corner of said section; thence continue N 00°19'30" W on said line 285.14 feet to a point on the Southerly right-of-way line of State Highway 105; thence N 75°33'15" E on said Southerly right-of-way line, 1366.93 feet to a point on the Westerly line of that tract of land described in Book 19950 at Page 323 of said records; thence S 00°06'30" E on said Westerly line, 620.19 feet to the Southwest corner of said tract; thence N 89°43'16" E on the Southerly lines of those tracts of land described in Book 1950 at Page

323, Book 1526 at Page 193, Book 1795 at Page 378 and Book 1953 at Page 613 of said records, 1320.90 feet to the Southeast corner of that tract of land described in Book 1953 at Page 613 of said records; thence S 00°06'16" E, 564.95 feet; thence S 23°35'20" E, 90.60 feet; thence S 88°21'47" E, 489.41 feet; thence on the arc of a curve whose chord bears S 04°41'06" W, having a central angle of 06°05'47", a radius of 760.00 feet, and an arc length of 80.87 feet; thence S 80°26'00" E on a non-tangent line to said curve, 460.85 feet; thence N 54°34'30" E, 587.90 feet; thence 89°52'45" E, 1160.00 feet to the point of beginning and containing 210.083 acres more or less.

Bent Tree Filing II

That portion of the South half of Section 17 and of the North half of Section 20, Township 11 South, Range 66 West of the 6th P.M., El Paso County, Colorado more particularly described as follows: Commencing at the Southeast corner of said Section 17; thence S 89°18'29" W (a; bearings used in this description are relative to the East line of said Section 17, which was assumed to be N 00°07'15" W) on the South line of said Section 17, 30.00 feet to a point on the Westerly right-of-way line of Roller Coaster Road and the POINT OF BEGINNING; thence N 00°07'15" W, on said Westerly right-of-way line, 1124.24 feet to a point on the Southerly line of Bent Tree I as recorded in Plat Book Y-3 at Page 68 of the records of said County; thence Westerly on said Southerly line for the following ten (10) courses, (1) thence S 89°52'45" W, 855.00 feet; (2) thence S 83°00'00" W 79.56 feet; (3) thence S 25°00'00" W, 128.45 feet; (4) thence N 77°18'00" W, 479.98 feet; (5) thence S 12°45'00" W, 107.44 feet; (6) thence on the arc of a curve to the right having central angle of 09°00'00", a radius of 950.00 feet and an arc length of 149.23 feet; (7) thence N 68°18'00" W on a non-tangent line to said curve, 576.58 feet; (8) thence S 48°27'34" W, 312.83 feet; (9) thence S 38°41'00" W, 439.26 feet; (10) thence S 51°00'00" W, 255.00 feet; thence 07°35'06" E, 553.28; thence S 01°43'00" W, 345.00 feet; thence S 13°20'00" E, 500.00 feet; thence S 90°00'00" E, 290.04 feet; thence 71°31'00" E, 421.78 feet; thence S 00°59'00" E, 430 feet; thence on the arc of a curve to the left whose chord bears S

76°45'30" W. having a central angle of 24°31'00", a radius of 410.00 feet and arc length of 175.44 feet; thence S 64°30'00" W on the forward tangent to said curve, 60.00 feet; thence S 25°30'00" E, 60.00 feet; thence S 21°23'00" E, 370.42 feet; thence S 81°24'30" W, 568.56 feet; thence N 86°03'00" W, 240.01 feet; thence S 36°01'00" W, 950.00 feet to a point on a line being 50.00 feet Northerly of and parallel with the South line of the North half of said Section 20; thence S 00°27'26" E, 20.00 feet to a point on the Northerly right-of-way of Higby Road; thence N 89°32'34" E on said Northerly right-of-way line, 2482.92 feet; thence N 00°27'26" W, 935 feet; thence N 89°32'34" E, 842.43 feet to a point on the aforementioned Westerly right-of-way line of Roller Coaster Road; thence N 00°00'07" W on said Westerly right-of-way line, 1678.96 feet to the Point of Beginning.

Bent Tree Filing III

Those portions of Sections 17, 19 and 20, Township 11 South, Range 66 West of the 6th P.M., El Paso County, Colorado, more particularly described as follows: BEGINNING at the most southwesterly corner of Bent Tree I as recorded in Plat Book Y-3 at Page 68 of the records of said El Paso County; thence Easterly on the Southerly line of said Bent Tree I for the following five (5) courses; (1) thence N 90 degrees 00 minutes 00 seconds E (all bearings used in this description are relative to those as platted in said Bent Tree I), 525.00 feet; (2) thence N 47 degrees 40 minutes 00 seconds E, 805.92 feet; (3) thence N 86 degrees 31 minutes 00 seconds E, 740.00 feet; (4) thence S 61 degrees 05 minutes 00 seconds E, 595.30 feet; (5) thence N 90 degrees 00 minutes 00 seconds E, 98.00 feet to a point on the Westerly line of Bent Tree II as recorded in Plat Book D-4 at Page 39 of said records; thence Southerly, Northeasterly and Westerly on said westerly line for the following fourteen (14) courses; (1) thence S 07 degrees 35 minutes 06 seconds E, 553.28 feet; (2) thence S 01 degrees 43 minutes 00 seconds W, 345.00 feet; (3) thence S 13 degrees 20 minutes 00 seconds E, 500.00 feet; (4) thence S 90 degrees 00 minutes 00 seconds E, 290.04 feet; (5) thence N 71 degrees 31 minutes 00 seconds E, 421.78 feet; (6) thence S 00 degrees 50 minutes 00 seconds E, 430.00 feet; (7) thence on the arc of a curve to the left whose chord bears S 76 degrees 45 minutes 30

seconds W, having a central angle of 24 degrees 31 minutes 00 seconds, a radius of 410.00 feet and an arc length of 175.44 feet; (8) thence S 64 degrees 30 minutes 00 seconds W on the forward tangent of the last mentioned curve, 60.00 feet; (9) thence S 25 degrees 30 minutes 00 seconds E, 60.00 feet; (10) thence S 21 degrees 23 minutes 00 seconds E, 370.42 feet; (11) thence S 81 degrees 24 minutes 30 seconds W, 568.56 feet; (12) thence S 86 degrees 03 minutes 00 seconds W, 240.01 feet; (13) thence S 36 degrees 02 minutes 00 seconds W, 950.00 feet; (14) thence S 00 degrees 27 minutes 26 seconds E, 20.00 feet to a point on a line being 30.00 feet Northerly of and parallel with the East-West center of Section line of said Section 20, said parallel line also being the northerly right-of-way line of Higby Road; thence S 89 degrees 32 minutes 34 seconds W on said Northerly right of way line, 1932.70 feet to a point on the west line, 1285.63 feet to the Southwest corner of the Northwest quarter of the Northeast quarter of said Section 19; thence N 89 degrees 25 minutes 37 seconds W on the South line of the east half of the Northeast quarter of the northeast quarter of said Section 19, 659.94 feet to the Easterly line of Arrowwood No. 1 as recorded in Plat Book Z at Page 78 of said records; thence N 00 degrees 15 minutes 22 seconds E on said Easterly line, 1316.66 feet to a point on the southerly line of Arrowwood Subdivision No. 2 as recorded in Plat Book A-2 at page 66 of said records; thence Easterly and Northerly on the Southerly and Easterly lines of said Arrowwood Subdivision No. 2 for the following two (2) courses; (1) thence S 88 degrees 34 minutes 17 seconds E, 656.12 feet; (2) thence N 00 degrees 19 minutes 30 seconds W, 120.50 feet to the Point of Beginning.

Bent Tree Filing IV

That portion of Section 17, Township 11 South, Range 66 West of the 6th P.M., El Paso County, Colorado, more particularly described as follows: Commencing at the Northeast corner of said Section 17, thence S00°07'15"E, 30.01 feet along the east line of said Section 17 to the Southerly right of way of State highway 105; thence N88°52'40"W, 30.01 feet along said Southerly right of way line to a point on the Westerly right of way line of Roller Coaster Road, said point also being the point of beginning of the tract of land herein described; thence

S00°07'15"E, 289.77 feet along said Westerly right of way line; thence S89°52'45"W, 140.00 feet; thence S00°07'15"E, 75.00 feet; thence N 89°52'45"E, 140.00 feet to said westerly line right of way line of Roller Coaster Road; Thence S00°07'15"E, 2733.78 feet along said westerly right of way line to the Northeast corner of Bent Tree I as recorded in Plat Book Y-3 at page 68 at reception No. 1254250 of the records of said County. (The following seven (7) courses are along the northerly and westerly lines of said Bent Tree I: (1) thence S89°52'45"W, 1160.00 feet; (2) thence S54°43'31"W, 587.90 feet; (3) thence N 80°26'00"W, 460.85 feet; (4) thence along the arc of a curve concave to the west, said curve having a chord bearing of N04°41'06"E, a central angle of 06°05'47", a radius of 760.00 feet, for an arc distance of 80.87 feet; (5) thence N88°21'47"W, 489.41 feet; (6) thence N23°35'21"W, 90.60 feet; (7) thence N 00°06'16"W, 564.95 feet to the Southeast corner of that tract of land described in Book 1953 at page 618 of said records; thence 00°06'16"W, 1289.52 feet along the Easterly line of said tract of land described in Book 1953 at Page 618 to said Southerly right of way line of State Highway 105; thence N44°25'46"E 42.90 feet along said southerly right of way line to a point on the Southerly line of the re-filing of Spring Park subdivision as recorded in Plat Book C-2 at Page 11 of said records; (the following two (2) courses are along the Southerly and Easterly lines of said re-filing of Spring Park Subdivision.); (1) thence N89°42'12"E, 1290.55 feet; (2) thence N 00°06'59"W, 1249.27 feet to said Southerly right of way line of State Highway 105; (the following three (3) courses are along said southerly right of way line.); (1) Thence along the arc of a curve concave to the South, said curve having a chord bearing of N78°17'26"E, a central angle of 23°10'02", a radius of 717.94 feet, for an arc distance of 290.29 feet; (2) thence N 89°52'27"E, 357.86 feet; (3) thence S 99°52'40"E, 651.16 feet to the point of beginning and containing 153.52 acres more or less.

APPENDIX 2 DWARF MISTLETOE

The species of dwarf mistletoe that infects ponderosa pine is *Arceuthobium vaginatum*. It only infects ponderosa pine. Other species of mistletoe infect other conifers.

Dwarf mistletoe is a parasitic flowering plant, not a fungus. It has roots, stems and leaves and produces seeds. Because it lacks chlorophyll it must draw its nutrients from the tree.

Trees die slowly from dwarf mistletoe. It may take 10 to 15 years for a ponderosa pine to die after the crown has become heavily infected. Heavy infection itself may take decades to develop. Small, lightly infected, trees (4-9" diameter) may live 30 years while larger, lightly infected trees (>9" diameter), may live for 60 years. Life span is severely decreased for moderate to heavily infected trees. The tree usually dies back from the top, creating a spike-top.

Seeds are released from dwarf mistletoe in late summer. As the seed capsule dries out, seeds are ejected and usually travel a distance of 10 to 15 feet. They land on needles, and are washed onto branches where they germinate. It takes about six years for female dwarf mistletoe plants to produce seed.

Dwarf mistletoe spreads slowly among adjacent trees of the same size, usually advancing only a few feet per year. The most serious situation for infection is when a tall tree is infected and showers large numbers of seeds on younger trees. In this situation infection can affect understory trees within a radius of about 30 feet.

Because dwarf mistletoe kills and deforms branches, dwarf mistletoe-infested areas have increased fire-risk because of dead wood.

Total eradication of dwarf mistletoe is often not feasible because clearcutting is the only effective method and this may be unacceptable to homeowners. Spread of dwarf mistletoe from small patches may be prevented by isolating the patch by clearcutting a minimum 50 foot

buffer zone. Spread can be slowed by severe thinning of surrounding forest.

Light dwarf mistletoe infections in small trees can be mitigated by pruning. In some cases it may be best to remove the most heavily infected trees (especially larger ones) and keep less infected ones, realizing that mistletoe acts slowly to kill the tree. Dwarf mistletoe plants protruding from tree trunks can be broken off periodically.

In the meantime, other species, notably Douglas fir, lodgepole pine, other conifers or aspen can be planted. Do not plant Scotch pine, as this is susceptible to the dwarf mistletoe species that infect ponderosa pine. When new trees are large enough to provide canopy cover and satisfactory visual features, the infected pines can be removed and new ponderosa pines, which will be long-lived, can be planted.

Bibliography

C.S.U. Extension. Dwarf Mistletoe (Color flyer).

Jacobi, W.R.; Swift, C.E. Dwarf mistletoe management. Service in Action Sheet 2.925. In Colorado Springs, call C.S.U. Extension 636-8926.

Hawksworth, F.G.; Johnson, D.W. 1993. You can save your trees from dwarf mistletoe. USDA Forest Service General Technical Report RM-226. Fort Collins, CO. (Free from the Publications Department of the Rocky Mountain Forest and Range Experiment Station in Fort Collins.

APPENDIX 3 MOUNTAIN PINE BEETLE

Mountain pine beetle, *Dendroctonus ponderosae*, is one of several species of bark beetles native to ponderosa pine forests. It is important because feeding activity of the larvae beneath the bark, and a fungus carried by the beetles from infected to healthy trees, will cause tree death.

Periodically beetle populations may become very large and millions of trees are killed over a period of a few years. The last significant mountain pine beetle epidemic in the Front Range was in the late 1970s and early 1980s.

Trees should be checked for mountain pine beetle infestation during fall, winter and spring months. Trees which have been attacked will have pinkish pitch tubes along the trunk. These trees should be checked again in early summer. Sometimes a tree is attacked and has pitch tubes, but the beetles were caught in the pitch and never entered below the bark. These "pitch out" trees will not turn brown in June-July and will have clear yellow wood. Remove a bark sample with a hatchet to check for this.

Successfully infected trees will turn brown in June-July because the combination of damage from larval feeding and the fungus will prevent uptake of water. These trees will have bluish wood caused by a stain from the fungus.

Infected trees should be cut down as soon as they are identified. They should be cut and treated no later than mid-August, and preferably before that. Branches can be disposed of at the slash/mulch site, by burying, or burning.

Infested trunks should be treated with lindane, the bark peeled, or covered tightly with black plastic so that heat can kill the larvae. Do not take infested wood to the slash/mulch site.

Mountain pine beetles are very small, about the size of the head of a match. They can be distinguished from *Ips* beetles (another kind of bark beetle which commonly colonizes dead wood rather than live trees) by smooth wing covers compared to jagged wing covers of *Ips*. Ponderosa pine wood is home to many other kinds of beetles, some of which feed on wood, and some of which are predatory on other insects including the mountain pine beetle. Long-horned and short-horned wood-boring beetles are commonly found in wood piles. These are large, handsome beetles which do not cause damage to living trees. Enjoy them as part of the forest ecosystem.

Because *Ips* beetles colonize freshly dead wood, large populations can build up in firewood piles. If firewood is stacked between live trees, *Ips* beetles may transfer to live trees and can transmit the blue-stain fungus. Do not stack firewood against live trees. Drive in some metal posts and place the firewood between to posts, a safe distance from the house and away from trees.

Cranshaw, W.S.; Leatherman, D. 1992. IPS beetles: characteristics and control. C.S.U. Extension. Service in Action Sheet 5.558. In Colorado Springs call C.S.U. Extension 636-8926.

Leatherman, D.A.; Cranshaw, W.S. 1991. Mountain pine beetle and related bark beetles. C.S.U. Extension. Service in Action Sheet 5.528. In Colorado Springs call C.S.U. Extension 636-8926.

USDA Forest Service. 1978. Protect your pines from mountain pine beetles. Rocky Mountain Forest and Range Experiment Station. Fort Collins, CO.

APPENDIX 4 NOXIOUS WEEDS AND OTHER EXOTIC PLANTS

Noxious weeds are listed by the Colorado Department of Agriculture. By law, these weeds are to be eradicated. County Weed and pest agents have primary responsibility for enforcing noxious weed control.

Noxious weeds of concern in El Paso County included three species of knapweed (diffuse, spotted and Russian), leafy spurge, Canada thistle and musk thistle. The knapweeds usually occur on grasslands such as pastures along I-25 and State Highway 83. Leafy spurge occurs northwest of Monument along the Front Range and may be spreading into northern El Paso County from Douglas County. It is also mainly a rangeland plant, but prefers deeper soils than knapweed.

Canada thistle and musk thistle are most often found along roadsides but may occur in pine forests and subirrigated

meadows. They are the most likely ones to occur in Bent Tree.

Musk thistle can be easily controlled by preventing seeds from forming. Cut the plant below ground level with a hoe before the flower heads begin to form. If the plant is flowering, use a pruning shears to remove the plant at ground level, sack it in black plastic and kill the seeds with heat. Dispose of the sacked, dead plants in trash pickup. Since these usually occur singly or in small groups it is not necessary to use herbicide.

Canada thistle is more difficult to control. It has deep lateral roots from which new shoots develop. Cultivation which breaks up the root system will only cause more shoots to grow since root pieces can survive for a long time. The best control is to remove the top of the plant often enough to deplete the food reserves of the roots, and improving the vigor of competing grasses. This can be done by mowing, herbicide treatment of the thistle, or removing the tops by pruning at ground level several times during the growing season if the infestation is minor. Dispose of flowering stalks by sacking.

Reducing populations or spread of several other plants not on the state noxious weed list may also be desirable. Downy brome (*Bromus tectorum*) may invade disturbed areas. This is an annual grass which greens and grows quickly in the spring and then dries out by mid-June. Mow this grass before seeds form and seed the area with perennial species such as a fescue mix or western wheatgrass.

Smooth brome (*Bromus inermis*) is a large pasture grass introduced from Hungary in the 1870s. This grass reproduces both by seeds and underground stems (rhizomes). It forms dense stands which crowd out other plants. Because it is such a strong competitor it is a threat to populations of native plants. When it grows in the trees, it is a fire hazard. It has the potential to change the understory fire susceptibility characteristic from low (bunchgrasses and scattered forbs) to high loading of fine fuels.

Control of smooth brome is the same as for any perennial. Mow before seeds form, more repeatedly to deplete underground storage and use herbicide if mowing is impractical. Do not use seed mixes containing smooth brome.

Redroot pigweed (*Amaranthus retroflexus*) is a forb that colonizes disturbed areas. It is a prolific seed producer and can build up large populations if left alone. Eventually populations will be succeeded by other plants, but succession can be hastened by rototilling at 2-3 week intervals for a growing season, and planting perennial grasses in the fall.

Beck, K.G. 1991. Musk thistle: biology and management. C.S.U. Extension. Service in Action Sheet 3.102.

Beck, K.G. 1994. Canada thistle: biology and management in pastures and rangeland. C.S.U. Extension. Service in Action Sheet 3.108.

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Guidelines for Colorado Noxious Weed Management Fund Applications

Overview:

The Colorado Noxious Weed Management Fund (the Fund) was created by the Colorado Legislature, in part, to provide grants or contracts to communities, weed control districts, or other entities for the purpose of assisting local cooperative efforts with noxious weed management projects. Organized private interests as well as public agencies may apply for moneys from the Fund provided that the moneys will be utilized to further weed management efforts in the State of Colorado. The following guidelines have been created to assist applicants in the development of proposals that meet the criteria by which the Colorado Department of Agriculture (the Department) will base its determination of merit and award grants.

Approximately \$225,000 is available in fiscal year 1997-98 through the Fund for noxious weed management grants or contracts. Due to limited funds and the number of applications the Department expects to receive, awards will be made on a competitive basis with strong preference given to projects that incorporate the priority features described below. In the interest of using the Fund as efficiently as possible, the Department will favor projects that utilize effective and innovative strategies to address weed management problems that many communities across the state face. Rather than a source of permanent funding for noxious weed management within a local area, the Fund should be considered an opportunity to help initiate working partnerships, explore and demonstrate successful collaborative efforts, and build on those successes to develop permanent funding sources for the maintenance of long-term weed management efforts. Consequently, the Fund will be used primarily to stimulate new management efforts, add management capacity, and leverage untapped cash and in-kind resources rather than to redirect existing, dedicated weed management funds.

General Application Guidelines

Each application should clearly and briefly:

1. identify the local, regional, or statewide problem(s) addressed by the proposed project,
2. describe local weed management needs and how they could be met with state assistance,
3. demonstrate that the proposed project is an efficient and effective approach to achieving project goals and objectives as well as resolving recognized problems,
4. present the tasks/activities to be carried out within a reasonable timeframe,
5. identify and provide means to monitor and evaluate the project's progress and results,
6. delineate the entities/partners, respective responsibilities, and financial contributions, and
7. demonstrate local commitment to weed management and the project.

Incomplete applications will be returned unevaluated. Requested information which is not applicable to the proposed project should be identified by marking appropriate spaces with "N/A." In addition, the application should clearly identify the project coordinator as the contact who will be responsible for representing the project to an evaluation team as needed and negotiating the terms of an offer if made (see below).

Funding Limitations and Matching Resources

While the Department hesitates to set an absolute limit to the amount of funding an applicant may request, it is suggested that \$25,000 be considered the maximum amount requested. Applicants should recognize that the funding of several large requests during the same award cycle will be difficult due to revenue limitations. This fact will be considered when prioritizing projects statewide. The guideline amount is presented not to discourage requests in excess of this amount, but to advise applicants of program revenue limitations. However, a project that exceeds the suggested maximum amount will be considered provided that it meets a clear need, resolves a regional or statewide problem, and provides adequate matching resources.

In addition, all applicants should consider very carefully the amount of matching resources leveraged relative to the request. Larger matching amounts, especially cash funds, generally enhance the competitiveness of an application. However, applicants with relatively few opportunities to access, utilize, or create alternative funding sources will be given due consideration. Please note that this year the Department is seeking an average matching resource ratio of 2:1, i.e. for every dollar provided by the state, applicants should contribute on average two dollars in matching cash and in-kind resources.

Priority Features for 1997-98 Funding:

For the 1997-98 funding cycle, the Department will favor new projects that emphasize on-the-ground management directed at eradicating, containing, and managing noxious weed populations. Applications that primarily emphasize other weed management efforts such as education, mapping, and research are welcomed, but may receive a smaller portion of funds.

Applications that successfully incorporate one or more of the following features will receive priority consideration for awards in 1997-98:

1. Problem Identification and Resolution: Emphasis will be placed on the applicability of the proposed project to the resolution of similar weed management problems in other parts of the state. The problem statement in the application must identify a problem or set of problems that the proposed project seeks to resolve. Innovative projects that successfully resolve the identified problem(s) will be used as models to other communities across the state that face similar circumstances.
2. Partnerships: The formation, expansion, or strengthening of cooperative relationships among public and/or private partners promotes coordinated and effective weed management strategies. Coordinated efforts are often a hallmark of successful landscape level weed management programs. The Department strongly encourages proposed projects to incorporate this feature whenever appropriate and to establish formal resource-sharing arrangements and agreements that specify the role and weed management responsibilities of each partner.

3. Rapid Response: The Department strongly encourages timely management responses to threats posed by infestations of noxious weeds that are newly arrived in the state, have recently been found in a new region of the state, or are found in discrete and manageable populations. Containment and eradication should be the achievable, short-term management objectives of such proposals.

Special Note regarding Rapid Response Grants: Funds may be applied for at anytime so that necessary resources can be made available in a timely fashion. Management funded in this category must follow accepted weed management practices that focus on eradicating satellite populations while containing and eventually eradicating more well-establishment populations. Furthermore, rapid response grants are not available to provide for the annual management of noxious weed infestations that should be contained and eradicated as part of the normal duties of local weed management programs. Rather, they are available to make possible timely management efforts in circumstances of short-term financial shortages when sudden discovery poses difficulties for local budgets or to provide additional financial support for containment efforts on larger or more well-established infestations.

All rapid response grants should be discussed with the state weed coordinator prior to initiating an application to ensure that the situation merits funding in this category.

Secondary Features

In addition to the priority features described above, there are a number of other features that will also be weighed when considering the merits of each application. Each application should include explicit information about these features so the application presents a thorough overview of the proposed project.

1. Impact: The projected impact of the project on targeted noxious weeds as well as the impact that grant funds may be expected to have on continued local weed management efforts in future years will be examined. Although the Department may accept applications in future years for continued projects, there is absolutely no assurance that continued funding will be granted. Awards do not imply continued support in future years and multi-year projects must anticipate obtaining necessary funding from other sources.
2. Sensible Management: Proposed projects should use sensible weed management strategies that not only stress integrated pest management techniques, but recognize relevant ecological factors that affect the efficient and cost-effective management of an area. Projects should include a landscape approach that considers watersheds, as well as, wind, water, wildlife, and human vectors and attempt to manage the impacts of these features.
3. Integrated Pest Management: Applicants should plan and implement a program that utilizes a variety of methods for managing noxious weeds in order to achieve desirable plant communities. Such methods include biological, chemical, cultural, and mechanical management techniques. Applications must be explicit with regard to the use of integrated pest management techniques appropriate for the type of project proposed. When developing a

proposal that considers the elements of integrated pest management, applicants should consider all appropriate and available control and management methods, seeking those methods which are least environmentally damaging and which are practical, economically reasonable, and effective.

4. Matching Resources: In order to make the most of the state's limited financial resources, the Department strongly encourages grant applicants to seek and provide matching cash and in-kind resources. One important purpose of the Fund is to spur innovative weed management programs and leverage additional public and private resources toward local weed management objectives. This year, the Department seeks an average matching resource ratio of 2:1, i.e., for each dollar provided by the state, applicants should contribute on average two dollars in matching financial and in-kind resources. Matching resources may include direct expenditure of applicant funds for necessary project costs, including contracted professional services, and/or in-kind staff support and services necessary to complete project tasks.
5. New Programs: The Department will use the Fund to stimulate new weed management efforts and add management capacity at the local, regional, and state levels. Therefore, applications that initiate cooperative and coordinated weed management programs and projects will be favored over well-established projects of a similar nature.
6. Targeted Weed Species: Applications must explicitly state the targeted species of noxious weeds. As mentioned above, a strong preference will be shown to projects that contain and eradicate new infestations. However, preference will also be shown for management of well-established species, such as those listed as Colorado's Top Ten Noxious Weeds.

Award Process

Applications will be accepted through December 15th, 1997. Until this date, the state weed coordinator will be available to provide appropriate technical assistance in the preparation of applications. Applications will be reviewed by an evaluation team and ranked on merit against other proposals. Applicants may be contacted by a member of the evaluation team during the evaluation process if additional information or clarification of existing information is required. Final selection and decisions will be made by the Colorado Agricultural Commission and the Commissioner of Agriculture. Every effort will be made to ensure that awards from the Fund are made equitably and distributed broadly around the state provided that proposals of sufficient quality are available from all areas of the state.

Additional information may be included or required with each application. County weed management plans, intergovernmental agreements among partners, an outline of the project's timeline and objectives, etc., will be helpful in presenting a detailed picture of the project and its participants to the evaluation team.

Awards:

An announcement of award decisions will be made in writing after February 17th, 1998. A decision letter approving an application for Colorado Noxious Weed Management Fund moneys is only a conditional offer to enter into a mutually acceptable grant agreement or contract; it is not a legal funding obligation of the State of Colorado. The conditional offer to enter into an agreement or contract will be held open until June 15th, 1998. If a mutually acceptable agreement or contract is not executed by that date, the Department's conditional offer will be withdrawn by that date.

Awardees should not encumber or expend any funds before they receive written notification from the Department that they may encumber or expend such funds. Until such time as a contract or agreement is fully executed and approved, no obligation of state funds exists.

A contract or agreement will set forth the specific performance criteria for each award. Awardees should refer to the contract or agreement for a full explanation of the terms and conditions of the award. However, at a minimum, receipt of an award binds the applicant to the following conditions:

1. The funds cannot be spent in a manner inconsistent with the purposes outlined in the application without the written consent of the Department.
2. All awardees must submit a progress report to the Department upon request that describes the development and implementation of the project, the number of acres of targeted noxious weeds treated, and other pertinent information. Progress report forms will be sent to all grant recipients with instructions. It is imperative to the success of this program, and hence the possibility of receiving additional funds in the future from the Colorado Legislature, that a complete and detailed report be submitted.
3. Failure to begin or continue the project according to the agreement or contract, following receipt of an initial payment, will permit the Department to seek repayment of any awarded funds previously paid, and to cancel the agreement to pay any remaining funds under the award on such terms and conditions as the Department may determine.

Additional Questions:

For additional information about the Colorado Noxious Weed Management Fund, please call Eric Lane, State Weed Coordinator, at (303) 239-4182, write the Colorado Department of Agriculture, 700 Kipling Street, Suite 4000, Lakewood, CO 80125-5894, or send email to elane6276@aol.com.

APPENDIX 6. LANDSCAPING FOR ECOLOGICAL INTEGRITY.

The plant list identifies native species, or introduced species that have form and life histories similar to native species, are not invasive and do not tend to be ladder fuels. Recommended shrubs are good for wildlife browse, berries or cover.

All are commercially available, but some may need to be ordered from specialty nurseries, some of which are wholesale only. Annually ordering bulk quantities wholesale, especially for grass seed, might be appropriate. The Homeowners Assn. may be eligible for wholesale purchases from some of the businesses listed.

Grasses:

western wheatgrass	<i>Agropyron smithii</i>
slender wheatgrass	<i>Agropyron trachycaulum</i>
thickspike wheatgrass	<i>Agropyron dasystachum</i>
blue grama	<i>Bouteloua gracilis</i>
sideoats grama	<i>Bouteloua curtipendula</i>
Arizona fescue	<i>Festuca arizonica</i>
Chewings fescue	<i>Festuca rubra commutata</i>
creeping red fescue	<i>Festuca rubra</i>
prairie junegrass	<i>Koeleria cristata</i>
annual ryegrass	<i>Lolium multiflorum</i>
perennial ryegrass	<i>Lolium perenne</i>
Canada bluegrass	<i>Poa compressa</i>
redtop	<i>Agrostis alba</i>
Columbia needlegrass	<i>Stipa columbiana</i>
needleandthread	<i>Stipa comata</i>

Wildflowers:

black-eyed susan	<i>Rudbeckia hirta</i>
prairie coneflower	<i>Ratibida columnaris</i>
galliardia	<i>Galliardia aristata</i>
wild strawberry	<i>Fragaria americana</i>
yarrow	<i>Acillea millefolium</i>
silvery lupine	<i>Lupinus argenteus</i>
wild bergamot	<i>Monarda fistulosa</i>
golden banner	<i>Thermopsis montana</i>

Shrubs:

common chokecherry	<i>Prunus virginiana</i>
wild plum	<i>Prunus americana</i>
silver buffaloberry	<i>Shepherdia canadensis</i>
cinquefoil	<i>Potentilla fruticosa</i>
ninebark	<i>Physocarpus monogynus</i>
common snowberry	<i>Symphoricarpos albus</i>
mountain mahogany	<i>Cercocarpus montanus</i>
golden currant	<i>Ribes aureum</i>
whitestem gooseberry	<i>Ribes inerme</i>
fringed sage	<i>Artemisia frigida</i>
Wood's rose	<i>Rosa woodsii</i>

Trees:

aspen	<i>Populus tremuloides</i>
narrow leaf cottonwood	<i>Populus angustifolia</i>
plains cottonwood	<i>Populus deltoides</i>
green ash	<i>Fraxinus pennsylvanicus</i>
Douglas fir	<i>Pseudotsuga menziesii</i>

Bibliography and seed/plant sources

- Rondon, J. 1980. Landscaping for water conservation in a semiarid environment. City of Aurora, Department of Utilities. Aurora, Colorado.
- Applewood Seed Co. 5310 Vivian St. Arvada, CO 80002. 303-431-7333
- Applewood Seed and Garden Group. 5380 Vivian St. Arvada, CO 80002. 303-431-6283.
- Arkansas Valley Seed Company. 4333Hwy. 66 Longmont, CO 80504. 970-535-4481.
- Bitterroot Native Growers. 445 Quaft Lane. Corvallis, MT. 59828. 406-961-4702. (\$500 min order-wholesale)
- Granite Seed Co. 1697 West 2100 North. Lehi, UT 84043. 801-768-4422.
- Gully Greenhouses. 6029 S. Shields. Fort Collins, CO 80526. 970-223-4769.
- Little Valley Wholesale Nursery. 13022 E. 136th Ave. Brighton, CO 80601.
- Prairie Nursery. PO Box 306 Westfield, WI 53964. 608-296-3679.
- Sharp Bros Seed Co. 101 E. 4th St. Rd. Greeley, CO 80631. 970-356-4710.



Woodland Park District
P.O. Box 9024
113 So. Boundary
Woodland Park, Colorado 80866
(719) 687-2921

FOREST STEWARDSHIP

STEWARDSHIP INCENTIVES PROGRAM (SIP)

This federally funded program provides cost share assistance to private landowners for implementing sound forest management practices on their property under the guidance of a Forest Stewardship Management Plan. Such a plan has been developed by Dr. Judy von Ahlefeldt in cooperation with the Bent Tree Homeowners Association.

Under this plan each individual landowner in the Bent Tree subdivision may apply for project cost sharing for one or more of the 9 practices described on the attached page.

Funding for SIP is somewhat limited and competition for available dollars is keen. For this reason, only the following components under SIP-3 (Forest Improvement) will be considered priorities for Bent Tree Homeowners:

- Woodland Pruning
- Woodland Improvement (thinning)
- Defensible Space (thinning immediately around houses and other structures for fire mitigation)

Cost share maximums cannot exceed:

1. 65% of eligible and documented costs incurred by the landowner.

or

2. Individual practice component maximums:

- Woodland Pruning - \$47.00 per acre
- Woodland Improvement - \$200.00 per acre
- Defensible Space - \$750.00 per property

or

3. \$1,000.00 per acre treated

or

4. \$10,000.00 per landowner per year

For Example: Actual total costs for thinning and pruning trees on a two acre property are:

PRUNING - \$150.00 (65% of \$150 = \$97.50, component maximum cost share = \$94.00 or \$47.00 x 2 acres. maximum cost share benefit would be \$94.00 based on the component maximum.

THINNING - \$500.00 (65% of \$500 = \$325, component maximum cost share = \$400.00 or \$200.00 x 2 acres. maximum cost share benefit here is \$325.00 based on the lower amount of 65% of actual costs.

THEREFORE - The total cost share amount reimbursed to the landowner would be \$419.00 (\$94.00 + \$325.00).

In order for cost share benefits to be paid, accurate records of expenses must be kept. This might be as simple as a paid invoice from a tree service, or as complex as receipts and/or canceled checks for expense items such as; chainsaw gas and oil, chain sharpening, chipper rental, slash hauling etc. Additionally, personal time should be recorded on the attached form.

TO APPLY FOR SIP COST SHARE

1. Consult with a Colorado State Forest Service Forester (CSFS) (719) 687-2921.
2. Go to the local USDA Farm Service Agency office (formerly known as Agricultural Stabilization and Conservation Service - ASCS) at 1826 East Platte, Suite 102 and get "signed up" for cost share assistance.
3. Wait for practice approval. **Do not start practice without approval letter from the Farm Service Agency office or cost share cannot be granted.**
4. Upon receiving the approval letter begin practice.
5. Upon practice completion, contact CSFS and arrange for a final inspection.
6. Provide CSFS with cost documentation.
7. Sign all necessary forms and return to Farm Service office.

Cost share payment will be processed by Farm Service office.



Colorado's Stewardship Incentives Program General Program Information



This information sheet and the attached SIP Practice Fact Sheets provide a general review of Colorado's Stewardship Incentives Program. For more information contact your local Colorado State Forest Service (CSFS) office. Pay particular attention to the Participation Requirements, Program Procedure and Payment Limitations on the reverse side.

BACKGROUND

The 1990 Farm Bill formally recognized stewardship of private forest land and land suitable for growing trees as vitally important to the conservation of this nation's natural resources. The bill authorized the Forest Stewardship Program (FSP) and the Stewardship Incentives Program (SIP). Through state forestry agencies, FSP provides public education and land stewardship planning and technical assistance to private landowners. SIP is designed to assist private landowners in implementing land stewardship activities recommended in their long-range forest stewardship plan.

The Colorado State Forest Service (CSFS) and the Agricultural Stabilization and Conservation Service (ASCS) are jointly responsible for SIP in Colorado. The CSFS coordinates program delivery, while the ASCS processes applications and arranges landowner payments.

One of the unique aspects of FSP is its broad based support. A state Forest Stewardship Coordinating Committee meets regularly to recommend program direction that meets the unique needs of Colorado. This twenty-two member group consists of federal, state and private conservation organization representatives as well as private landowners.

LANDOWNER ELIGIBILITY

Those who own 1,000 acres or less of private land suitable for growing trees, have a land management plan that meets FSP standards (except when applying for SIP-1), and belong to one of the following groups are eligible to participate in SIP:

- individuals, including foreign owners
- joint owners
- American Indian tribes or other native American groups
- groups and associations
- corporations without publicly traded stock
- other private legal entities

Note: Landowners with more than 1,000 acres, but not more than 5,000 acres, may submit a waiver request to the state forester. Approval is based on unique attributes of the property and potential for public benefit.

ELIGIBLE PRACTICES

Nine SIP practices are available for cost-share assistance:

- SIP-1 Landowner Forest Stewardship Plan Development
- SIP-2 Reforestation and Afforestation
- SIP-3 Forest Improvement

ELIGIBLE PRACTICES (continued)

- SIP-4 Agroforestry Establishment, Maintenance and Renovation
- SIP-5 Soil and Water Protection and Improvement
- SIP-6 Riparian and Wetland Protection and Improvement
- SIP-7 Fisheries Habitat Enhancement
- SIP-8 Wildlife Habitat Enhancement
- SIP-9 Forest Recreation Enhancement

Each practice is accomplished through the implementation of one or more components. Individual SIP Fact Sheets are available for each practice.

PARTICIPATION REQUIREMENTS

Implementation of any SIP practice is subject to the following requirements:

- Cost-shared practices must be implemented according to a landowner forest stewardship plan.
- Treatment area must be protected from destructive grazing and wildfire.
- All chemicals must be used according to federal, state and local regulations as well as label instructions.
- After establishment, each practice must be maintained for a minimum of 10 years.
- Prescribed fire will be used only in accordance with state and local regulations.
- Fencing will be cost-shared only when a practice cannot be adequately established without it.
- Before a practice is implemented, consideration must be given to its potential impact on flora and fauna listed or proposed for listing as Threatened or Endangered by the U.S. Fish & Wildlife Service.

PROGRAM PROCEDURE

The following procedures are generally followed by SIP:

1. After consultation with CSFS, landowner signs up for SIP at local ASCS office.
2. SIP request is forwarded to CSFS Service Forester for eligibility determination.
3. Service Forester visits site to determine need and practicality of requested SIP practice.
4. Eligible requests are prioritized and approved, disapproved or deferred by CSFS Area Forester based on state priorities and availability of funding.
5. CSFS approved requests are implemented by the landowner.
6. Upon practice completion, landowner notifies CSFS Service Forester and provides a appropriate cost documentation.
7. Service Forester certifies practice(s) completed according to specifications and approves landowner payment.
8. ASCS issues landowner payment.

Note: Steps 2, 3, 4, and 7 may result in project ineligibility, disapproval or decertification. Landowner will be notified of this determination by the ASCS office.

PAYMENT LIMITATIONS

Cost Share payments can not exceed any one or a combination of the following:

- 65% of eligible and documented landowner costs.
- The established maximum rates for each practice component (see practice fact sheets).
- \$1,000 per acre.
- \$10,000 per landowner, per year.

Note: The combination of two or more of these limitations may result in cost-share payments of less than 65% of actual landowner expenditures.

COLORADO STATE FOREST SERVICE
SIP 3
FOREST AND AGROFOREST IMPROVEMENT

COMPONENT	DATE HRS.	DATE HRS.	DATE HRS.	DATE HRS.	DATE HRS.	DATE HRS.	DATE HRS.	TOTAL HOURS	EQUIP. RENTAL
PREScribed BURNING 338									
FENCING FE1 ELECTRIC FE2 BARBWIRE FE3 WOVEN 382									
NUTRIENT MANAGEMENT: FERTILIZER 590									
WOODLAND PRUNING 660									
WOODLAND IMPROVEMENT 666									
DEFENSIBLE SPACE 660A/666									
GRAND TOTAL OF HOURS.....									

NAME: _____ ADDRESS: _____

PHONE: _____

GRAND TOTAL HOURS _____ X \$ _____/HOUR = \$ _____

SIGNATURE: _____ DATE COMPLETED: _____

- biological diversity** - the diversity of life (species) and processes which sustain life
- biomass** - the living stuff in a plant or animal. For example tree biomass consists of wood in roots, trunks and branches plus the material in the leaves.
- canopy** - the above-ground portion of plants. For trees this refers to branches and leaves.
- canopy gap** - openings in forests where there are no trees.
- coniferous** - trees or shrubs which have evergreen needles which persist for several growing seasons
- crown fire** - a destructive fire which spreads among tree canopies and consumes the entire forest
- deciduous** - trees or shrubs which drop leaves at the end of each growing season
- defensible space** - an area around a structure with reduced fuels
- doghair stand** - a thick grove of young trees
- ecosystem diversity** - biological diversity applied to a specific ecosystem such as a forest or meadow
- ecosystem integrity** - the retention of native plants and animals in an ecosystem
- exotic species** - plant or animal species introduced from another, distant ecosystem. For example, cattle or linden trees in Colorado prairie ecosystems
- horizontal forest structure** - the variety of forest structure encountered as one moves across an area
- invasive plant** - plants which reproduce rapidly and displace other plants. Examples are dandelions or Canada thistle.
- matrix** - what most of landscape consists of. For example thinned forest versus unthinned forest.
- native plant** - plant species which have been in an area for thousands of years
- noxious weed** - plants specified by the Colorado State noxious weed list which have been deemed harmful to native ecosystems and agriculture
- patches** - areas within the landscape that are different from the matrix
- Pikes Peak Wildfire Prevention Partners** - a confederation of agencies in the Pikes Peak Area which provides information to landowners about wildfire prevention

prescription - a set of management actions designed to produce a particular landscape pattern

SIP funding - Stewardship Incentive Plan Funding. Money available through the Colorado State Forest Service which assists land owners to have good land management.

snag - a big, old dead tree useful for wildlife habitat

soil series - groups of similar soils. A category used to describe soils in COunty soil surveys.

stagnation - a forestry term referring to a slowing of tree growth because of overcrowding or old age

stewardship - caring for the land by using accepted good management practices

suppressed trees - a forestry term referring to trees which are growing very slowly in diameter and height because of overcrowded conditions

surface fire - a cool fire which removes understory vegetation but does not kill trees

understory - the plants which grow beneath a tree canopy. It may consist of smaller trees, shrubs, grasses or flowers

vertical forest structure - the variety of structure in a forest from the ground to the top of the canopy.

weed containment - prevention of the spread of weeds

weed eradication - total removal of weed populations

APPENDIX 9

IMPLEMENTATION RECOMMENDATIONS

RECOMMENDED CHANGES TO BENT TREE COVENANTS

1. #4 page 1 "lots shall be maintained in their natural state as nearly as possible..."
Further guidance is needed regarding mowing and management of forest regeneration and smooth brome. If what is meant by "natural" is to retain ecological integrity (i.e. encourage NATIVE species), then homeowners need to be able to balance management for fire safety and human tendencies for "neatness" with the "natural" tendency for ecosystems to have dead trees, tall grass, piles of branches and other ecosystem components which add diversity and wildlife habitat. This also addresses landscaping choices and the importation of non-native species which may aggressively spread.
2. E (6) roofing - eliminate cedar shake shingles as a choice because of excessive fire risk.
3. 14 (Landscaping) - Homeowners should be encouraged to use native species.
4. 10 (Clearing of trees) - this needs to be redesigned so that trees larger than 4" can be cut to improve fire safety or resistance to mountain pine beetle infestation. I would suggest that homeowners present a management plan for their lot to the neighborhood inventory and management group leader who will consult with them and adjacent landowners and then present the request to the Forest Stewardship Committee between January and April each year, for implementation between May and December. The four-inch diameter rule is too rigid.
5. (Noxious Weed Control) - this is not being enforced, at least during early August 1997. A subcommittee needs to be formed to work with landowners on noxious weed control.

IMPLEMENTATION SCHEDULE

1997 Distribution of Forest Stewardship Plan to Homeowners.

Organization of Neighborhood Groups as subcommittees of the Bent Tree Forest Stewardship Committee per the Inventory and Management Hierarchy:

I. Bent Tree Homeowners Association

II. Bent Tree Forest Stewardship (One member from each Inventory and Management Unit-I,II & III.) Two additional members might be selected to work with Bent Tree IVA and IVB.

III. Neighborhood Leaders (one from each of 12 Inventory and Management Units).

1998 Neighborhood meetings to educate homeowners, identify problems and create neighborhood three-year landscape management plans.

Such plans would include actions to manage noxious weeds, forest diseases, fuel amounts and contiguity, snags, mowing, fire access and escape routes.

Neighborhood Leaders coordinate with Forest Stewardship Plan Implementation Subcommittee to apply for available funding.

1999 Phased plans created in 1998 would continue.
2000

2001 Neighborhood plans reevaluated and revised as to needed. Another set of three-year plans devised
2004 after results of 1998-2000 results have been evaluated. Plans to include same items as specified in 1998 and any additional items.

2004
to
2007 Repeat process for 2001-2004.

Obviously this is going to take commitment and cooperation on the part of homeowners. It is the action and commitment of each lot owner that will make this Forest Stewardship Plan work. Their cooperation is needed for annual evaluation of management, input for course of action and implementation..

The burden of neighborhood-level organization should not be the entire responsibility of a few dedicated people of the Forest Stewardship Committee. Organizing neighborhoods and Subdivision Areas must involve others.

I suggest that an annual dinner be held in March to promote the program, to recognize the past year's work and perhaps to present some awards. A Web Site might be organized for communication and generous use of the telephone and neighborhood "coffee" get-togethers is recommended.

Each subdivision area could organize one Forest Stewardship Program per year (3 per year, 4 when Bent Tree IV is ready) to present information on fire safety, wildlife habitat, ecological issues and so forth. This could be coordinated by the Forest Stewardship Committee.

Bent Tree has one of the strongest and best-organized homeowners groups in the Black Forest area and is in a position to provide a model of leadership and good forest management for the entire Palmer Divide area. I hope this Forest Stewardship Plan will give homeowners a powerful tool to accomplish worthwhile goals.

IMPLEMENTATION RECORD

Implementation of the Forest Stewardship Plan can be tracked by annually recording the actions taken at the lot and neighborhood level, with reports due by January 15. This information can be aggregated upward into a report by Subdivision Filing and then to all of Bent Tree. Units can be number of acres, or number of lots receiving a particular action.

Preparation of neighborhood reports should be done by Neighborhood Leaders. Forest Stewardship Committee members can compile neighborhood reports and present the information to the Bent Tree Property Owners' Association.

The recommended schedule is below:

1997

Sept - Dec. organization of committees and identification of problems by neighborhood

1998

January 15 completion of neighborhood recommendations for submission to the Forest Stewardship Plan Implementation Subcommittee.

January 30 completion of Subdivision area recommendations for submission to the Forestry Planning Committee.

Feb.- April time for planning for action and applying for project funding.

April- Oct. project action

Nov.-Dec. submission of information to Neighborhood Leaders

1999 and thereafter

January 15 completion of neighborhood reports for submission to the Forest Stewardship Plan Implementation Subcommittee.

January 30 completion of Subdivision area reports for submission to the Forestry Planning Committee.

Feb.- April time for planning for action and applying for project funding.

April- Oct. project action

Nov.-Dec. submission of information to Neighborhood Leaders

Sample summary forms for tracking implementation:

Neighborhood Form

YEAR	AREA/LOT	ITEM	ACTION/ACRES

Subdivision Area Form

YEAR	AREA	ITEM	ACTION/ACRES

"ITEMS" based on the guidelines and recommendations in this Forest Stewardship Plan might include specific items in the categories of:

Environment and fuels management

Overstory thinning (number of trees removed; prescription category; size classes)

Understory thinning (number of acres treated)

Slash removal

Trunk pruning (number of trees < 4" dbh limbed up)

Defensible space around structures

Use yes/no checklist to rate each developed lot in Sept/Oct for:

clean gutters and roof

safe area around chimneys and eaves

30' defensible space around structures (reduced fuel amounts and contiguity)

safe landscaping

mowed or raked areas

firewood stacked safely

flammable materials stored properly

clearly marked driveway

Escape routes and fire access

U-shaped driveway or driveway with loop

driveable fire access to rear property line (trees spaced far enough apart to permit vehicular access if needed)

contiguity of fire access with neighboring properties

alternate escape routes

Fire resistant construction materials

Roof

Walls

The above ITEMS apply mainly within the boundaries of Bent Tree Subdivision. However, important actions can be taken, and possibly funded, by cooperative action and agreements among subdivisions and with the assistance of the Tri-Lakes Fires Department. Two of these are: establishment of a slash/mulch recycling program in the Tri-Lakes Area and placement of additional water storage facilities for all-season fire-fighting. Implementation suggestions for these is beyond the scope of this report, but these actions are strongly recommended to facilitate for short and long-term forest management.