

**Horsetooth Mountain Park
Forest Management Plan
1998**

**Colorado State Forest Service
Fort Collins District**

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Introduction

Objectives

Reducing fire potential and, insect and disease control, are the primary emphasis areas identified by managers for Horsetooth Mountain Park. This plan focuses on these issues.

Process

Larimer County Parks requested development of a forest management plan for Horsetooth Mountain Park. To keep costs low, stands were delineated as large units (figure 1). Most of these stands will require further division into treatment units when the plan is implemented and prescriptions are marked on the ground. Park personnel and volunteers collected plot information for the inventory and consolidated the field data for further analysis. Colorado State Forest Service produced this plan based on the information provided by the park.

Acknowledgments

This plan is the result of several individuals providing information and assistance. Mike Fleming, Larimer County Parks did the majority of the field data collection. Mike was assisted by volunteers from Larimer County. John McFarland and Daryl Burkhart initiated the project and arranged for funding. Andre' Duvall, Colorado Division of Wildlife, reviewed the plan for wildlife issues. Steve Kettler provided information about species of concern with a special emphasis on invertebrates.

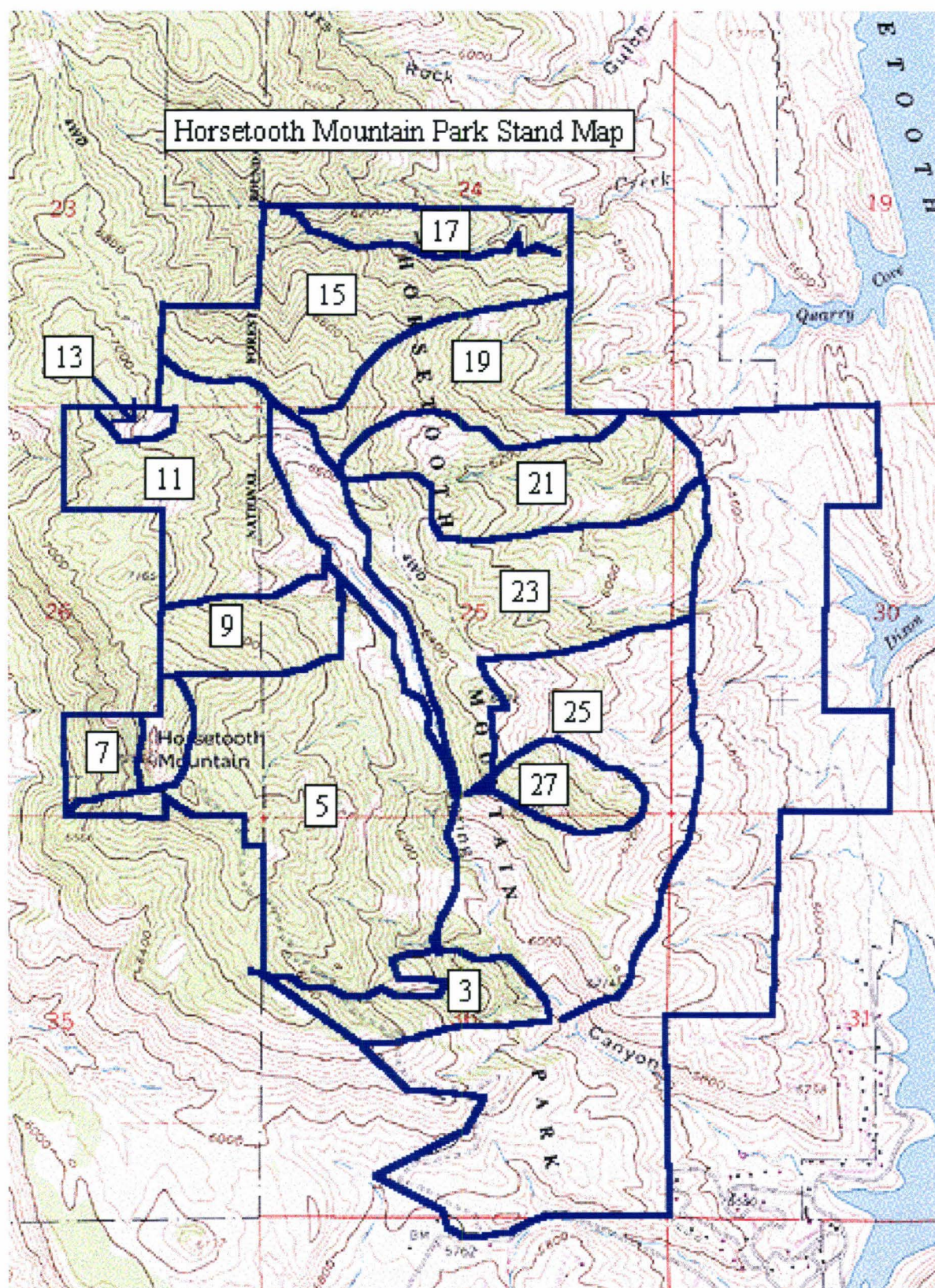
General Description

Horsetooth Mountain Park is located in the foothills west of Ft Collins, CO. Detailed background information about the park can be found in the Horsetooth Mountain Park Management Plan, (draft)1998. Elevations range from 5440 to 7255 feet. There are several vegetation types including grasslands, riparian areas, mountain mahogany(*Cercocarpus montanus*) shrublands, Ponderosa pine(*Pinus ponderosa*), and Ponderosa pine-Douglas-fir(*Psuedotsuga menziesii*) forest. Geology is complex with many large rock outcroppings including the dominant landscape feature, Horsetooth Rock. Horsetooth Reservoir is located to the east and Lory State Park to the North. Private lands abut the property to the West, South and East. Because of the intermix of recreation lands with private, the park is heavily used in conjunction with adjacent recreational properties.

2107
Acres
table pg 7

Fire Hazard

The primary cause of wildland fire on state and private land(non federal lands) in Larimer



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County is human ignition. High visitor use increases the potential for human caused wildland fire in the park. Although eleven percent of wildland fires are caused by lightning, the geology and topography of Horsetooth increases the likely hood of a lightning caused fire. In the event a fire starts on the property, actions taken in advance can reduce fire severity and increase likelihood of control and suppression. Ten of fourteen forest stands have been identified as having a Wildfire Hazard rating of Severe. Table 1 and figure 2 summarize this information. It should be noted that not every acre of each of these stands is severe hazard, with some areas of medium hazard. This plan recommends thinning forest stands, removing understory and ladder fuels, and use of prescribed fire to reduce fire hazard. Public information about fire management should be made available to park visitors.

Two scenarios were done to evaluate the potential of a wildfire in the park. The first scenario was a fire in a forest stand, the second a fire in shrub and grassland plant community. Assumptions of the scenario were a July afternoon with 80 degree temperatures, 15 percent humidity and two wind speeds, one of 10 miles per hour and a second scenario of 20 miles per hour (appendix 2). Under these conditions flame lengths were predicted to be at least 5 ½ feet high in the forested site to greater than 11 feet in the shrub. Rate of spread of these fires would range from 8 feet a minute to 100 feet per minute. Firefighters can effectively fight fire with flame length up to 4 feet maximum. Beyond 4 feet flame lengths, firefighting must be done with heavy equipment and aircraft. With these realistic conditions, a fire started in the park could be as large as 500 acres within one hour. Under the 20 mile per hour wind scenario in shrublands, the wildfire would have to burn until it reaches areas with less fuel available. Reducing fuel loads in the park, can be done by creating fuel breaks in conjunction with existing roads and trails. These actions will break up existing areas of continuous fuels and improve opportunities for firefighters to control future wildfire.

Insects and Disease

Mountain Pine Beetle

Mountain pine beetle (MPB), *Dendroctonus ponderosa*, is the most important pest of western pine forests. Trees that are growing slowly due to old age, crowding, poor growing conditions, etc are the most susceptible to MPB. MPB were found in four of fourteen stands. Not all beetles were detected during this survey. This plan recommends immediate actions be taken to control MPB.

Once MPB successfully attack and infest a tree, nothing practical can be done to save the tree. MPB have a one year life cycle in Colorado(Appendix 3). In late summer adults leave the dead tree where they developed. Recently emerged adults attack green trees and tunnel under the bark. If the female beetle is successful in boring into a tree, she emits pheromones that attract male beetles. After mating each female can produce up to 75 eggs, which then develop into larvae that overwinter under the bark. In the spring the larvae continue growth and emerge as adults later that summer inot the fall. As the adults emerge it is difficult, if at all possible, to predict the direction and rate of spread of MPB.

Mountain pine beetles girdle the inner bark of the tree as they develop egg galleries under the bark. Larvae continue to enlarge the galleries as they develop through the year. In addition to girdling the tree under the bark, MPB carry bluestain fungi. This symbiotic fungi grows inside the tree and destroys the water transport system of the tree. The combination of girdling and fungi results in a very effective tree killer.

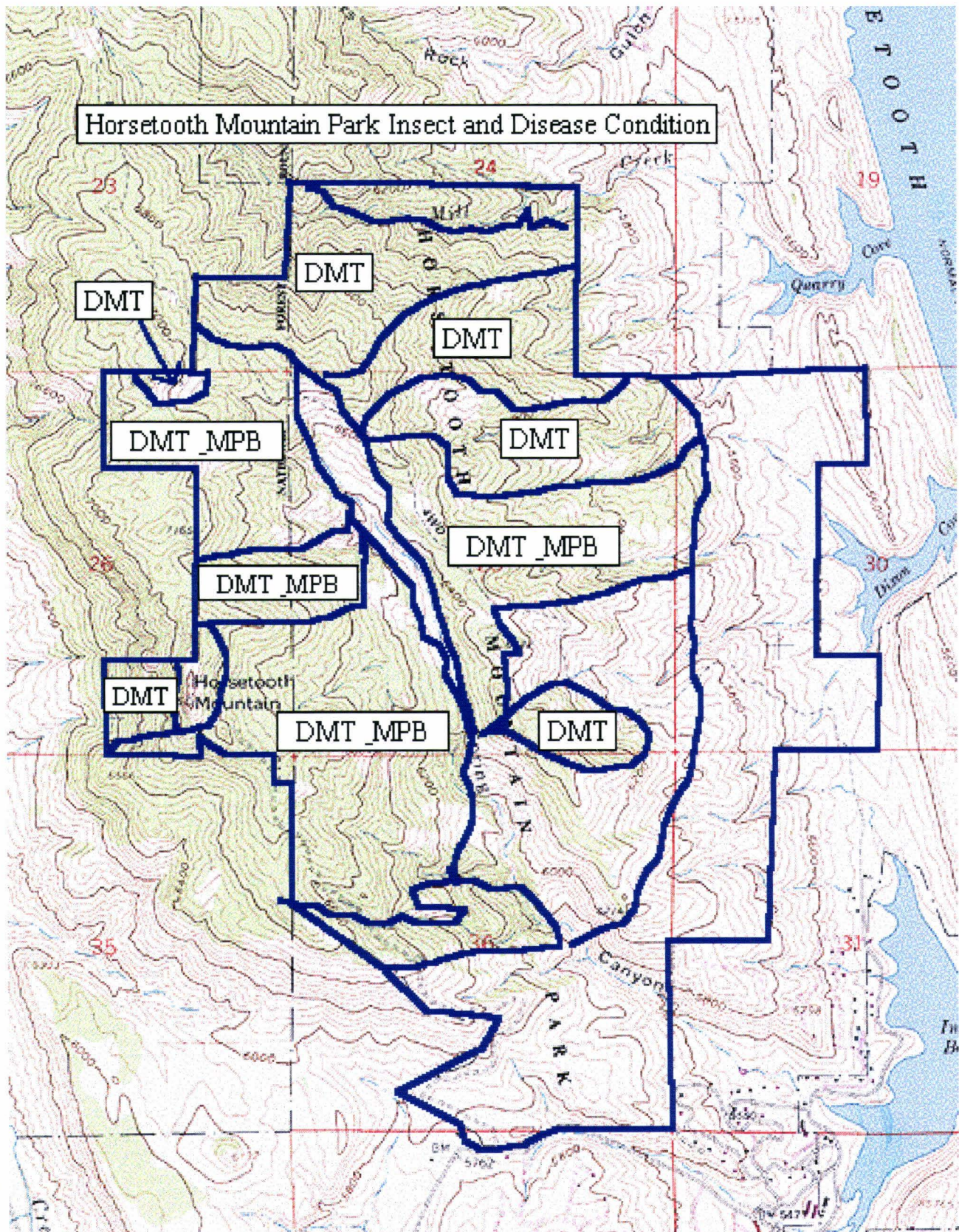
Direct control by removing and treating currently infested trees will reduce the immediate impacts of MPB. What appear to be minor infestations of beetle today can rapidly expand and kill large numbers of trees in a few years. Recommendations are to reduce timber stand density and improve individual tree growth and reduce possible impacts of MPB in future years.

Ponderosa Pine Dwarf Mistletoe

This parasitic plant is present in several areas of the park. Dwarf Mistletoe, *Arcethobium spp.*, is a slow killer of trees. Dwarf Mistletoe is often detected by looking for stunted and deformed trees that have grown in unusual shapes as a result infestations. Stress resulting from Dwarf Mistletoe(DMT) infestations increase trees susceptibility to attack by Mountain pine beetle and other insects. Stunted, broom shaped, densely branched trees that result also increase fire danger. Once a stand of trees becomes infected with DMT, unless the DMT is removed, DMT will continue to infect new trees as well as reinfecting previously infected trees. Recommendations are to reduce the rate of spread of new infections by isolating infected stands, or removal of all infected trees. If all infected trees are removed, the site may need to be planted. If the site regenerates naturally, the stand must be rechecked for DMT and sanitized within 5-15 years. Failure to do this will result in the same problem developing in the future.

DMT is often obligate to a single host species, in this case Ponderosa pine. Other species of trees are seldom infected. The plant spreads through seeds attaching to trees. When the seeds are ripe they are shot through the air by hydrostatic pressure that builds within the plant. Dispersal distances vary, but within an open tree stand the distance seldom exceeds sixty feet. In dense stands it is significantly less, one to three feet.

Preventing the spread of DMT into clean stands is the first priority. DMT must have a live suitable host to survive. Once a branch or tree is cut, the DMT plant will die. There is no need to remove DMT infested branches that have been cut and on the ground to stop the spread. Treatments that isolate highly infested stands using natural openings as well as roads and trails will keep the infestation within that group of trees and reduce the rate of spread.



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Stand Descriptions

The following general descriptions are based on field notes, field observations and review of inventory data. See attachment 3 for complete filed notes.

Stand 1

This stand was not sampled. It is mostly grass and shrub with very few isolated individual trees. Several soil types intermingle in this area, especially in the north, northeast part of the stand. Aspect is mostly east. CSFS Wildfire Hazard Map Area Rating A, low hazard grass and trees. Cheat grass dominates some areas. Use of prescribed fire to enhance butterfly habitat has been recommended. This is a difficult prescription to reduce cheatgrass (*Bromus tectorum*) and enhance native species and is the subject of ongoing studies. Review current literature for most recent findings when writing this prescription.

Stand 3

Ponderosa pine is the dominant species. Rocky Mountain Juniper (*Juniperus scopulorum*) and Douglas-fir are minor species in this stand. Soil type is mostly Wetmore-Boyle-Rock outcrop complex, 5-60% slope. Ridges running from west to east bisect this area. Percent slope varies greatly with in this stand, with primarily an east aspect. No insect or disease problems were found in this stand. Colorado State Forest Service Wildfire Hazard mapping rating C, severe hazard trees.

Stand 5

Ponderosa pine and Douglas-fir are the dominant species in this stand. Minor clones of Aspen (*Populus tremuloides*) were identified in this stand. Soil type is Wetmore-Boyle-Rock outcrop complex and Rock outcrop. This stand is on top of the ridge and aspect vary greatly, most are east, but vary north to east to south. Dwarf mistletoe is infecting areas of this stand with ratings as high as 6. See appendix 2 for an explanation of DMT rating system. Mountain pine beetle are active in pockets. CSFS Wildfire Hazard rating B, medium hazard trees.

Stand 7

Ponderosa pine and Douglas-fir are the dominant species. Soil type is Wetmore-Boyle-Rock outcrop complex, 5-60 % slope. Slopes are severe, up to 60 percent. Aspect is west. Dwarf mistletoe was identified in the stand. CSFS Wildfire Hazard Rating is B, medium hazard trees and C, severe hazard trees.

Stand 9

Ponderosa pine is the primary species. Douglas-fir is present to a lesser extent. Soil type is Wetmore-Boyle-Rock outcrop complex, 5-60 % slope. Aspect is northeast to north. Dwarf mistletoe is present throughout the stand with rating as high as 6. Mountain pine beetle were found in this stand. CSFS Wildfire Hazard Rating is B, medium hazard trees and C, severe hazard trees

Stand 11

Ponderosa pine and Douglas-fir are the dominant species. An isolated stand of aspen was found along Spring creek. Soil type is Wetmore-Boyle-Rock outcrop complex and a small area of Trag-Moen Complex, 5-30% slope. Aspect is primarily north to east. Dwarf mistletoe is present with ratings as high as 6. Mountain pine beetle is active. CSFS Wildfire Hazard Rating is B, medium hazard trees and C, severe hazard trees.

Stand 13

Ponderosa pine is dominant, with some Douglas-fir present. An isolated Lodgepole pine was reported in this stand. Soil type is Wetmore-Boyle-Rock outcrop complex, 5-60% slope. Aspect is south and east. Dwarf mistletoe is present, but less severe than other stands. No mountain pine beetle were found in this stand. CSFS Wildfire Hazard Rating is B, medium hazard trees.

Stand 15

Douglas-fir is the dominant species, with some Ponderosa pine. Soil type is Wetmore-Boyle-Rock outcrop complex. Aspect is north. Dwarf mistletoe is present, ratings as high as 6. No mountain pine beetle were detected. This stand has numerous blowdowns and dead trees. Severely overstocked stunted, mistletoe infested areas of regeneration from earlier removals have developed in some areas. CSFS Wildfire Hazard Rating is C, severe hazard trees.

Stand 17

Ponderosa pine is dominant with some Douglas-fir. Soil type is Wetmore-Boyle-Rock outcrop complex, 5-60 % slope. Aspect is east. No Dwarf mistletoe is present. No mountain pine beetle were detected. CSFS Wildfire Hazard Rating is B, medium hazard trees and C, severe hazard trees.

Stand 19

Ponderosa pine is dominant species. Douglas-fir is dominating the understory. Soil type is Wetmore-Boyle-Rock outcrop complex, 5-60% slopes. Aspect is east. Slope is 20-30 degrees. Dwarf Mistletoe is present with ratings as high as 2. No mountain pine beetle were detected. CSFS Wildfire Hazard Rating is B, medium hazard trees and C, severe hazard trees.

Stand 21

Ponderosa pine is the dominant species. Soil type is Wetmore-Boyle-Rock outcrop complex, 5-60% slope, Ratake Rock outcrop complex, 25-55% slope, and Kirtley loam, 3-9% slopes. Aspect is east, slopes 10-30 degrees. Dwarf mistletoe is present with ratings as high as 5. Mountain pine beetle were not detected. CSFS Wildfire Hazard Rating is B, medium hazard trees, with a small area C, severe hazard trees.

Stand 23

Ponderosa pine is the dominant species. Douglas fir is present on north facing slopes. Soil type is Wetmore-Boyle-Rock outcrop complex 5-60% slope and Ratake Rock outcrop complex. Aspect is variable, with the area being bisected by several drainages. Slopes are from 12-30 degrees. Dwarf mistletoe is present with ratings as high as 6. Mountain pine beetle are active. CSFS Wildfire Hazard Rating is B, medium hazard trees and C, severe hazard trees.

Stand 25

Ponderosa pine is dominant tree species. Stand is open with scattered pockets of trees. No regeneration was found in this stand. Soil type is Wetmore-Boyle-Rock outcrop complex, 5-60% slopes and Ratake Rock outcrop complex, 25-55% slopes. Aspect is highly variable. Slopes vary from 16 to 44 degrees. No Dwarf mistletoe or Mountain Pine beetle were detected. CSFS Wildfire Hazard Rating is A, low hazard grass and B, medium hazard trees.

Stand 27

Ponderosa pine and Douglas-fir are dominant species. Soil type is Wetmore-Boyle-Rock outcrop complex. Aspect is north. Slopes vary 8 to 40 degrees. Dwarf mistletoe is present, with ratings as high as 5. No mountain pine beetle were detected. CSFS Wildfire Hazard Rating is C, severe hazard trees.

Table 1. Stand summary table, Horsetooth Mountain Park, Larimer County, CO. 1998

#	Stem /Acre	Basal Area	Dia.	Ht.	Age	HZ ¹ Rate	MPB	DMT	Site Index	Regen	Acres
1	0	0	0	0	0	A	N	0	0	0	480
3	81	43	9.9	32	87	C	N	0	50	100-7000 avg 760	72
5	40	24	10.5	39	119	B	Y	0-6, avg 1	40	100-1400 avg 536	292
7	38	29	11.8	34	107	B,C	N	0-3, avg <1	35	100-200 avg 30	22
9	61	23	8.2	33	72	B,C	Y	0-6, avg 2	55	100-6900 avg 1200	56
11	82	43	9.8	43	101	B,C	Y	0-6, avg 1.5	50	100-2100 avg 480	150
13	14	5	8.0	25	37	B	N	0-2, avg <1	50	100-300 avg 50	8
15	110	46	8.8	43	152	C	N	0-6, avg 1	45	100-2300 avg 965	167
17	50	27	9.9	40	72	B,C	N	0	50	100-200 avg 50	44
19	82	44	9.9	46	109	B,C	N	0-2, avg <1	55	100-4900 avg 685	135
21	140	50	8.1	42	107	B,C	N	0-5, avg <1	50	100-6600 avg 830	99
23	57	26	9.1	38	105	B,C	Y	0-6,avg 1.5	50	100-4800 avg 334	239
25	18	14	12.0	35	113	A,B	N	0	40	0	303
27	140	50	8.1	42	107	C	N	0-5, avg <1	45	100-300 avg 60	40

Printouts summarized in this table are found in appendix 6.

¹ Colorado State Forest Service Hazard Map Ratings

O no hazard

A Low Hazard

B medium hazard trees

C severe hazard trees

X severe hazard brush

Prescriptions

Prescriptions emphasize restoration of the Front Range Ponderosa Forest through uneven age management. The situation at Horsetooth Mountain Park is an overstocked forest with small diameter trees. However in some areas, larger diameter trees are common and dominate the stand. Dwarf mistletoe is present in most stands. Prescriptions address isolating infected stands and removal of infected trees. Mountain Pine Beetle is also present at low levels. Prescriptions recommend improving overall tree vigor to reduce future beetle impacts in addition to immediate treatment of Mountain Pine Beetle.

Regeneration is lacking in some stands, and overstocked in others. Mechanical harvests and prescribed fire are recommended to reduce fuel loading. Thinning overstocked stands or isolating them and leaving for wildlife habitat is also recommended. Ponderosa seeds need contact with mineral soil for germination. Mechanical harvesting and prescribed fire is recommended to expose mineral soil to enhance regeneration where needed.

Forest management requires a long term commitment. After a stand has been treated, reentry into the stand will be required in the future. Prescriptions that regenerate stands may need thinning in 10 years. Prescriptions that reduce stand density and favor large diameter trees with little or no regeneration may not need treatment for 20 to 30 years. Updating the plan every ten years. Review accomplishments and reinventory the stands to identify future treatment needs.

General concepts for prescriptions are:

- 1) Save the largest trees. This should preserve most trees that pre-date grazing and fire exclusion. Select the best quality trees. When the younger, smaller diameter trees are in the best condition, consider removing the mature trees. Favor Ponderosa pine and Rocky Mountain Juniper over Douglas-fir. This does not mean to select defective, diseased Ponderosa over Douglas-fir. When trees are similar condition and size, favor Ponderosa.
- 2) Reduce the numbers of trees to a maximum basal area of 50. Kaufmann and others suggest tree numbers per acre in the 25-60 range, or a basal area around 50.
- 3) Manage trees in groups and clumps, varying density throughout the stand. Even spacing of trees similar to a 12 by 12 spacing is discouraged. Groups will provide structural stand diversity with some groups of trees more dense with 50 BA and other areas with no trees.
- 4) Retain snags. Try to retain two to four standing dead trees per acre. Small pockets (<1 acre) of standing dead trees, such as those killed by MPB, can be left where they do not pose hazard to park visitors. Standing dead trees >10 diameter are most beneficial.
- 5) Uneven age management will be used. To manage using this silvicultural system, it is useful to compare existing conditions to a desired future. The number of trees by diameter class is compared for each stand in this manner. Using a model called q stand, and a desired future basal area of 50, desired diameter distributions were projected (Appendix 4). Analyzing the

difference between the two curves shows where stands have too many and too few trees. Using this information markers can determine which size classes to protect when marking stands. Using stand 3 as an example, excess numbers of trees are found in the 6, and 10 to 14 inch size classes. Thinning these classes will encourage growth of the remaining trees. There is a shortage of trees in the > 14 inch size class. Markers should leave trees 14 inches and greater whenever possible.

Prescribed Fire

There is a great deal of interest in using prescribed fire to enhance Ponderosa pine forests. Prescribed fire is an appropriate tool in many situations. It is one of many tools available to manage a forest. All these tools should be used, selecting the best tool for the job at hand. Use of prescribed fire is recommended with some cautions. Managers should not assume that prescribed fire is appropriate for use on every acre of the park. Rather they should evaluate it along with the other tools of forest management to determine the best option to meet their goals.

Historically natural fires routinely burned areas of the front range of Colorado in the habitats present at Horsetooth Mountain Park. The frequency of these fires is debatable, times between burns said to average between 7 to 50 years or more, prior to the turn of the century. Since the turn of the century, wildland fires have been suppressed as quickly as possible. As a result the character of the vegetation has changed, increasing the amount of material to burn, decreasing the frequency of Ponderosa pine, and increasing the frequency of Douglas-fir stands. Prescribed fires can reduce the fuel loads and begin to return the vegetation to a more "natural" state. Fuel loads may need to be reduced mechanically, through thinning and harvests, before burning. Each stand will have to be carefully evaluated and a specific burn plan developed. Establish clear objectives for each burn.

Following each prescribed fire, evaluate if objectives were met. Modify future prescriptions based on these evaluations. In many cases it will be necessary to monitor effects for several years. Fires will need to be repeated over time. Once cool season fires have reduced fuel loads, consider objectives that can be met through warmer season burns. Vegetation response will determine when to burn. Air quality, recreation use, public relations, weather, and other factors will all influence timing of prescribed fires. In the case of shrub and grasslands, fire may be necessary within a few years to again reduce fuel loads. On forest lands, time intervals may be longer. Availability of browse, wildlife cover, nesting habitats etc should be evaluated as part of the equation.

Public support for prescribed fire use as a management tool is essential. Every opportunity must be taken to explain the objectives, desired outcomes, and how prescribed fire contributes to meeting those objectives. Wildland fire impacts and the need to suppress wildfire, as opposed to prescribed fires, should be explained. Develop interpretive displays, brochures and other visitor information systems to inform users about wildland fire and the use of prescribed fire as a management tool.

Prescription 1

Individual tree/group selection thinning to reduce stand density to basal area of 50. BA 100 is the maximum allowable in groups, however the stand will average 50. Manage groups of trees, creating openings for grasslands and future regeneration of trees. Systematic spacing of trees to manage for basal area is discouraged. Favor mature non defective trees. Leave wildlife trees that have no potential to fall onto trails or structures. Try to leave 2-4 snags per acre minimum. Preserve trees greater than 120 years unless they are hazardous. Favor Ponderosa pine over Douglas-fir when selecting removals. Favor other native species, except Douglas-fir over Ponderosa pine. One exception to the BA 50 is in dense regeneration of tall, small diameter trees. These should be thinned to growing stock level (GSL) 160. Growing stock level is remaining basal area following treatment, of trees less than 10 diameter that will result in a basal area of 50 when the stand averages 10 inch diameter. Small diameter trees that have grown in crowded conditions are susceptible to snow and wind damage. Thinning these stands and allowing the trees to grow for at least 10 years and then reentering to thin to GSL 50 will minimize these damages.

Remove: dwarf mistletoe infected trees.
 Suppressed trees
 deformed/defective trees

Maximum size of treatment unit is 25 acres. Several treatment units may be treated in the same stand in the same year, as long as they are not continuous.

Prescription 2

Patch cuts. Removal of all trees in the group. This can be done to create openings in unnaturally uniform stands of Ponderosa pine. Openings are desired for vegetative diversity and fuels reduction. This prescription will also be used to either remove stands severely infected with dwarf mistletoe or to isolate these stands. This prescription will also be used to remove doghair stands of weak and suppressed trees, that if thinned in other methods would be subject to snow damage and windthrow. See prescription 1 for guidance on thinning doghair timber stands. This prescription will also be used to reduce competition and improve Aspen stands. Aspen are shade intolerant. Increasing sunlight to reach Aspen clones will increase Aspen health and regeneration.

Prescription 3

Group Selection. This prescription will be used to remove overmature trees when the objective is to obtain natural regeneration. Markers must be aware of age of existing small diameter trees. These small diameter and height trees may be much older than they appear. Leaving these trees will perpetuate the problem of slow growth and small diameter trees. Residual stands of young trees must be protected as much as possible when using this

prescription. Resurvey the stand for results of regeneration and program future entry to replant if regeneration is less than 150 seedlings per acre.

Prescription 4

Fuel break creation. Along existing trails and roads, thin trees to reduce fuels. Separate tree crowns by ten feet within this area. Prune large trees so that the lowest branches are eight to ten feet above the ground. Do not prune more than 50 % of a trees branches. Remove shrubs that are under trees acting as ladder fuels. All woody residue resulting from this prescription will be chipped, or piled and burned. In no situations will this residue be left scattered on the ground. Mow road shoulder and trail sides where terrain and other conditions permit. Width of treatment will vary depending on the slope. Use the chart in Appendix 2 as a guide, with a minimum distance of 75 feet from the road center.

Prescription 5

Prescribed Fire-Piles. This prescription will be used to reduce fuel loads following thinning and other activities. Logging debris and slash will be piled and burned when there is 3" of snow. A burn plan should be written for pile burns and all necessary permits and notifications of emergency services, fire departments and other agencies must be done. Public relations effort will be required because this high use park is close to Ft Collins and highly visible from the city.

Prescription 6

Prescribed fire-Broadcast burn. This prescription will be used to reduce fuel loads, stimulated grass and forb production, rejuvenate shrubs. Prescribed fires need to be repeated over time to replicate the natural fire regime in Ponderosa pine. The exact timing of repeating prescribed fire will vary, depending on objectives, vegetation response and other factors. Introduction of prescribed fire will need to be done during cooler seasons to reduce existing fuel loads. After the fire regime has been established, warmer season burns may be utilized. Specific objectives and burn plans will be required for each individual burn. Safety must be the number one consideration during these burns. Air quality permits and notifications of emergency services,

fire departments and other agencies must be done. Public relations will be a major issue due to the high use and high visibility from Ft Collins. Private landowners in the area should be included early in the planning process to ensure that their issues and concerns are known and addressed.

Prescription 7

Mountain pine beetle control. Directly control actively infested trees by cutting down the tree. Managers have some options on treatment at this point. Chemical treatment is effective, but approvals and rules for use of chemicals are constantly changing. Carefully read and follow label instructions. Lindane and Silvisar products have been used in the past but are now unavailable or restricted use. Appendix 3 discusses these options in detail.

Non chemical control options include burning, peeling or burying the logs. Another option is to use solar radiation to kill larvae in the logs (Appendix 3).

High value trees can be preventative sprayed. Under current conditions this is not recommended. If visitor centers or other structures are developed in the future where certain trees are significant, individual spraying may be done.

Survey the park for trees that are infected in the late fall, starting in October. Look for faded trees and recently infected green trees. Treat the green trees if beetles successfully attacked the tree. Check for signs of successful attack such as sawdust & pitchouts. Peel bark if necessary to confirm beetle presence. Standing dead trees that do not have any active MPB may be left standing as wildlife trees as long as they will not pose any safety hazard along a trail etc.

Prescription 8

Planting. Purpose is to enhance natural regeneration and modify wildlife habitat. Plantings should emphasize native species. Plantings should not contribute to unacceptable increases in wildland fire danger. Species to consider should focus on the less common natives that occur in the area to increase plant diversity. Examples include Aspen, Narrowleaf cottonwood, Mountain Maple, Water Birch, Willow spp., along drainages and moist sites. In forested areas plant appropriate species such as ponderosa and Rocky Mountain Juniper to enhance species diversity when possible.

Implementation Plan

Implementation of forest management in the park will be contingent on availability of funds. This will fluctuate from year to year. Because of this fluctuation priorities are established, without specific years assigned. Managers may look at this list as a priority listing of how to proceed. If funds are available several projects could be accomplished in one year. If funds are minimal, possibly only one project may be accomplished in a given year.

It is doubtful that entire stands can or should be treated in the same year. Managers should break stands into treatment units. It is possible that several prescriptions may apply to each treatment unit because of the forest condition. For thinning and removals treatment unit size suggested is up to 25 acres. For prescribed fire, areas of treatment can be much larger, up to several hundred acres depending on the objective. Several treatment units within one stand may be treated at the same time, but it is anticipated that funding and other constraints will make this unlikely. Unit design should consider access, season of access, operational limits of personnel and equipment, maximum impacts in watersheds, impacts on wildlife, impacts on park users, mix of product, will the unit lend itself to a commercial sale, etc. Following the guidelines in Appendix 5, Best Management Practices (BMPs) for Colorado, will protect water quality and minimize impacts on the forest.

Several projects may be done by commercial logging. Once the specific project has been planned in detail, sale boundaries established, trees marked and volumes estimated a timber sale can be advertised. Loggers operating in the area may be interested in doing work in the park because of reasonable winter access compared to higher elevation sites. Managers should have "show me tours" of sales to ensure that both the manager and the logger understand all the conditions of the forest and the sale. Value will vary depending on the product and current market. A sample timber sale contract outline is in appendix 6.

There are some projects that will not produce any marketable timber product. These will have to be done by contract or in-house. Most work is beyond the ability of volunteers and typical free labor sources. Careful estimation of the amount of time and effort involved, along with safety issues, will determine if existing manpower can deal with the situation. As an example, control of Mountain Pine Beetle may sound like a project to be accomplished with in-house labor. A thorough survey for MPB may show that contracting would be the better option due to the extent of beetle attacks. Establishing sales that have some commercial product and some non commercial materials may be another way to get the work done through a timber sale.

The highest priorities for management are to control mountain pine beetle, reduce wildland fire hazard, and reduce rate of spread and isolate dwarf mistletoe.

Table 2. Implementation plan for Horsetooth Mountain Park, Forest Management plan.

Project #	Stand	Objective	Prescription	Comments
1	all	control mountain pine beetle	7	Annual Fall survey and treatment.
2	All	Fuel break creation	4,5,6	Along trails and roads. Highest use and trails near other properties first priority.
3	15	Reduce wildland fire hazard, forest restoration, DMT reduction	123568	This is one of the more remote stands, and is also adjacent to the most remote area of Lory State Park. There is evidence of unauthorized camping at Lory increasing potential for ignition. Some parts of this stand are severely overstocked, DMT infected with a Severe Hazard rating.
4	3	Reduce wildfire hazard, forest restoration	1,2,5,6	One of the most accessible stands. Hazard rating Severe.
5	27	Reduce wildfire hazard, forest restoration, DMT reduction	1,2,5,6	Severe Hazard, major trail, isolate stand 25 from DMT. 25 has no DMT.

6	23	DMT reduction, reduce wildfire hazard, forest restoration	1,2,3,5,6	Reduce DMT, isolate stand 25. 25 has no DMT.
7	11	DMT reduction , reduce wildfire hazard, forest restoration	1,2,3,5,6	High DMT rating
8	5 21 9 19 17 7 13	Forest Restoration, DMT reduction, reduce wildland fire hazard.	1,2,3,5,6, -8	These stands are of equal need for treatment
9	25	Forest Restoration, reduce wildland fire hazard, increase regeneration in open areas.	123568	One of the better condition stands, lacking regeneration
10	1	Habitat enhancement	6,8	Consult with CDOW and CNHP. Species to benefit from plantings must be identified.

Stand Prescription Narratives

Stand 1

This stand is primarily grass with a few scattered trees. There is no need to reforest this area. Projects here will focus on habitat enhancement for mule deer, small mammals and butterfly. Because of rare butterflies and other invertebrates that have been found in this stand, projects must be done following a plan with clear objectives that address these invertebrates. Impacts to butterfly habitat must be followed closely to ensure the changes have a positive impact. Prescribed fire in this area can create a mosaic of burned and unburned areas that will enhance native grass production while leaving unchanged refuges for the invertebrates. Objectives for the burn should include reduction of non native grasses. Planting plum, chokecherry, sumac, narrowleaf cottonwood, willow, woods rose and other will be beneficial for wildlife and provide plant diversity for users.

Stand 3

This stand has a severe wildfire hazard rating. Thinning of groups of trees to reduce basal area to a maximum of 100 will reduce fire danger, improve growth rates of remaining trees, increase resistance to mountain pine beetle attack, increase grass and forb

production for wildlife. There are several openings within this stand surrounded by dense pockets of ponderosa. Isolate stands of mistletoe or patch cut to remove the mistletoe. Isolating these stands of trees will provide wildlife cover while protecting the remaining forest stands from infection. Removing understory Douglas-fir and unnaturally dense mistletoe infected Ponderosa pine will further reduce fire hazard. If project #2 (fuel breaks) has not been accomplished, add prescription 4 along trail corridors.

Stand 5

Thinning groups of trees to reduce basal area to a maximum of 100 will reduce fire danger, improve growth rates of remaining trees, increase resistance to mountain pine beetle attack, increase grass and forb production for wildlife. Preserve >10" DBH trees whenever possible to develop larger diameter trees for the future. Removing understory Douglas-fir and unnaturally dense mistletoe infected Ponderosa pine will further reduce fire hazard. If project #2 (fuel breaks) has not been accomplished, add prescription 4 along trail corridors. Where Aspen is present use patch cuts to increase Aspen regeneration to benefit wildlife and increase species diversity. Consider overstory removal in situations where sapling to pole size ponderosa pine trees are in good condition and the overstory trees are in poor condition. Plan a pile burn to eliminate slab wood found in this stand.

Stand 7

Operations within this stand will be difficult because of slopes. Thinning groups of trees to reduce basal area to a maximum of 100 will reduce fire danger, improve growth rates of remaining trees, increase regeneration opportunities, increase resistance to mountain pine beetle attack, increase grass and forb production for wildlife. In areas where only Douglas-fir is present, consider creating openings for wildlife. Removing understory Douglas-fir and unnaturally dense mistletoe infected Ponderosa pine will further reduce fire hazard. There is a shortage of both large and small diameter trees. There are excess trees in the 10" DBH size class. Reduce stocking of 10" DBH trees while protecting both larger and smaller size classes.

Stand 9

This stand has medium to severe wildfire hazard ratings, Mountain pine beetle and dwarf mistletoe. Because of its location on the ridge top, MPB and DMT can easily spread downwind. These forest pests should be controlled to reduce their negative impacts. Because of the potential for human and lightning caused wildfire, fuel loads should be reduced. Thinning groups of trees to reduce basal area to a maximum of 100 will reduce fire danger, improve growth rates of remaining trees, increase resistance to mountain pine beetle attack, increase grass and forb production for wildlife. There are excessive numbers of trees in the 5 to 10" DBH size classes, especially in the 6" class. Removing smaller understory Douglas-fir and unnaturally dense and suppressed mistletoe infected Ponderosa pine will further reduce fire hazard. The stand appears to be middle aged and should respond well to thinning. Merriam's Turkey have been observed along the ridgetops in this area. Watch for any nest site and protect these during any

harvest during nesting season. Turkeys like large Ponderosa pine with open, flat branching for roost trees. Favor these trees when found in this stand, especially if found in protected areas out of direct west, northwest winds.

Stand 11

Adjacent to private property, management of this stand will increase protection of park lands from adjacent threats of fire, and insect and disease. It will also protect neighbors from these threat occurring on HTMP. This stand has Dwarf mistletoe and mountain pine beetle. Special emphasis should focus immediately on Mountain Pine Beetle. A large outbreak has been found. If not aggressively controlled, future impacts can be significant. There are excess trees less than 15" DBH. Thinning groups of < 12" DBH trees to reduce basal area to a maximum of 100 will reduce fire danger, improve growth rates of remaining trees, increase regeneration opportunities, increase resistance to mountain pine beetle attack, increase grass and forb production for wildlife. Protect 12" DBH and greater trees. Merriams Turkey have been observed along the ridgetops in this area. Watch for any nest site and protect these during any harvest during nesting season. Also turkeys like large Ponderosa pine with open, flat branching for roost trees. Favor these trees when found in this stand, especially if found in protected areas out of direct west, northwest winds. Aspen is present in the stand. Use patch cuts to increase Aspen regeneration to benefit wildlife and increase species diversity. Consider planting Aspen or other deciduous species along drainages in appropriate sites if natural regeneration is not acceptable.

Stand 13

This small stand has a medium hazard rating, one of the few within the park. No MPB were detected, DMT appears to be minor. Isolate the stand from adjacent stands that are infected with DMT. Elimination of DMT within the stand may be accomplished by removal of infected trees. Maintain existing stocking levels with the exception to remove DMT infected trees and severely suppressed trees. Watch for Turkey potential and follow guidelines in stand 11 for this stand also. Because of the proximity to the boundary and the road, a fuelbreak should be made along the road.

Stand 15

Treatment of this stand is a high priority. It has steep slopes, is overstocked resulting in competition between trees for nutrients and moisture, has mistletoe infected regenerated areas that have an average DBH of 2 inches, with a spacing of less between trees than 12 inches, and a maximum height of 8 feet. (See stand comparison chart). Other areas have advanced regeneration that is creating dense understory beneath mature Ponderosa and Douglas-fir. Some areas have significant amounts of dead and down material. All these factors combine to make a severe wildfire hazard. Because of the remote location of the stand and the high hazard it is recommended that this stand be the first treated. Some areas may be left dense for wildlife cover. If dense stands are left, isolate these stands. This will reduce the spread of DMT, fire hazard will

be reduced and cover will be provided for wildlife. Isolate DMT infected stand from clean stands when possible. Some DMT infected areas are in such bad condition that they should be removed and regenerated. If regeneration is unsuccessful, evaluate the benefit of diversity created by mosaics of meadow intermixed in the forest. Regeneration needs to increase. Prescribed fire and scarification should increase regeneration by exposing mineral soils. If needed, replant within 7 years. Minimum number of seedlings per acre is 150.

Stand 17

This stand is one of the better condition stands in the park.. There is no MPB or DMT and the Hazard rating is medium to severe. With some thinning from below and basal area reduction the hazard should be reduced. Basal area is low and the average diameter is 10 inches. This stand should develop into an open stand of Ponderosa with minor work at this time. Because of the basal area and large average diameter with several trees >10"DBH, this stand lends itself to a broadcast fire. Consider a cooperative project with Lory State Park to treat this stand with their forested lands across the fence. Access to this stand may be a problem because it is remote.

Stand 19

This stand has a low DMT rating and no MPB. This open stand should be treated to eliminate DMT. Some areas of thick ponderosa pine regeneration need attention. Remove Douglas-fir when it is acting as a ladder fuel. Evaluate these dense stands in terms of wildlife cover. If not all stands are needed for cover, thin regeneration to basal area 160 or less. Isolate areas infected with DMT and remove DMT infected trees from lightly infected areas. Enhance regeneration of riparian species along drainages, consider planting along drainages. Protect trees 14" DBH and greater.

Stand 21

This stand has dwarf mistletoe ratings as high as 5, however the stand average is <1. Isolate heavily infected stands, or remove depending on extent of infestation. No MPB is present. Ponderosa pine is the dominant species. Thin from below, remove suppressed and low quality pine to reduce the number of trees in the 6 to 10" size classes. Burning will cause sprouting of shrubs, enhancing wildlife habitat and reduce fuel loads. Plant riparian areas along intermittent drainage to increase diversity and enhance wildlife habitat.

Stand 23

This stand is primarily Ponderosa pine with some Douglas-fir intermixed. DMT occurred in several sample plots, rating values between 0-6, with a stand average of 1.5. Isolate and remove DMT infected stands. Old MPB killed trees were found. Continue to monitor for current beetle activity. The stand has a low basal area with some areas of dense regeneration. Protect regeneration from DMT and thin to basal area 160 or less. Thin mature areas of stand from below, removing suppressed and low quality trees. Favor mature Ponderosa pine and other native species over Douglas-fir. Stocking level of 10" and greater trees is low. Protect 8" DBH and greater trees.

Stand 25

Ponderosa pine dominate this open stand. This stand has the largest average tree diameter in the park. No DMT or MPB were found in this stand. Understory shrubs and grasses would benefit from prescribed fire. Mule deer appear to regularly use this area. No regeneration was observed in this stand. Removal of dense grass layer using prescribed fire or mechanical methods may improve regeneration. Because this stand is free of DMT thinning should be made along stand boundaries to isolate this stand from adjacent infected stands. Markers should remove DMT if found within the stand to keep it free of DMT. Wildfire hazard is low to medium. Thin pockets of trees so no pocket has a basal area greater than 160.

Stand 27

Ponderosa pine and Douglas-fir are equally represented within this stand. Understory is mostly Mountain Mahogany, common juniper(*Juniperus communis*), and grasses. DMT was observed throughout the stand, ratings from 0-5. Isolate DMT infected groups of trees and remove over time. Fire hazard is severe so this stand is a priority for treatment. Removing ladder fuels, suppressed and low quality trees will reduce the number of smaller diameter trees to a level closer to desired.. Favor Ponderosa pine during marking.

Record Keeping

Records must be maintained to document activities for future users. Forest management is a long term program. Rotation age for Ponderosa pine is up to 160 years. This means a seedling today will be mature in 120 to 160 years. The plan needs to be updated every ten years. This will include reinventory of stands, and review of actions taken. Accurate records will make the planning process easier in the future. Currently there are few records of volumes and size classes removed, previous insect and disease control activities, or wildfire occurrence in the past.

Miscellaneous projects

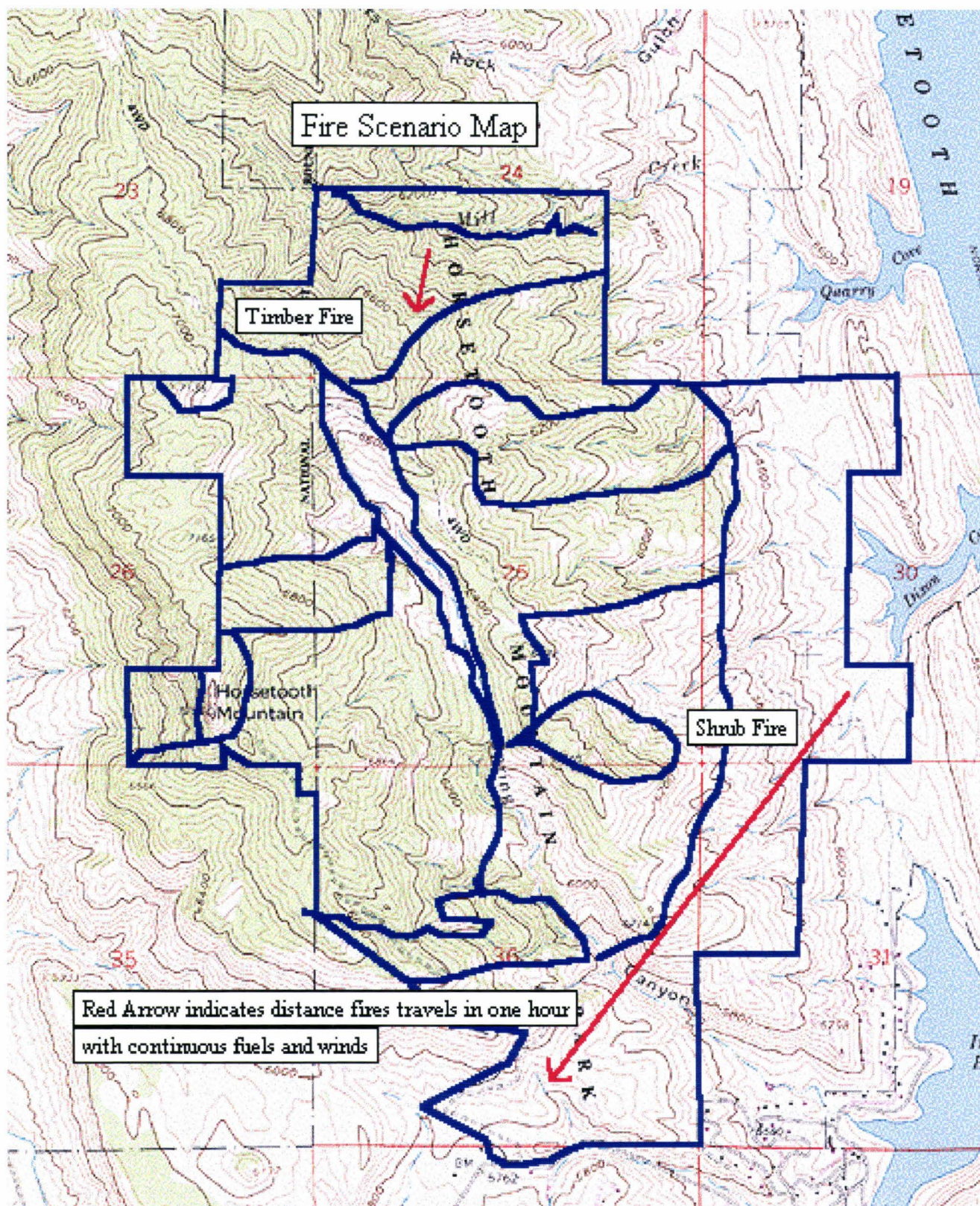
Wildfire Hazard Mitigation and Response Plan. A disc of the guide for this plan (Attachment 6) is available from Colorado State Forest Service, Fort Collins District office. Modify this plan as needed to make it appropriate for the park. Utilize the plan as a format to inform neighbors in cooperation with Poudre Fire Authority, VFD, Colorado State Forest Service, about wildland fire suppression issues that impact the community and about prescribed fire plans for the park. Host an open house with cooperating agencies for the public about the plan.

Appendix 1

Wildfire Information

Appendix 1

Wildfire Information



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NAME OF FIRE Forested Site FIRE PRED SPEC _____
 DATE 7/1/88 TIME 14:00
 PROJ PERIOD DATE _____ PROJ TIME FROM _____ TO _____

FIRE BEHAVIOR WORKSHEET

INPUT

0 PP	PROJECTION POINT	<u>A</u>	<u>A'</u>	_____
1 MODEL #	FUEL MODEL NUMBER (1-13)	<u>10</u>	<u>10</u>	_____
2 1H-FDFM	FINE DEAD FUEL MOISTURE, %	<u>3</u>	<u>3</u>	_____
3 LFM	LIVE FUEL MOISTURE, %	<u>150</u>	<u>150</u>	_____
4 MFWS	MIDFLAME WINDSPEED, mi/h	<u>3</u>	<u>6</u>	_____
5 SLP	SLOPE, %	<u>45</u>	<u>45</u>	_____
6 EWS	EFFECTIVE WINDSPEED, mi/h	<u>5</u>	<u>7.5</u>	_____

OUTPUT

1 ROS	RATE OF SPREAD, ch/h	<u>8</u>	<u>13</u>	_____
2 HA	HEAT PER UNIT AREA, Btu/sq ft	<u>1500</u>	<u>1475</u>	_____
3 FLI	FIRELINE INTENSITY, Btu/ft/s	<u>225</u>	<u>350</u>	_____
4 FL	FLAME LENGTH, ft	<u>5+</u>	<u>6+</u>	_____
5 SD	SPREAD DISTANCE, ch	_____	_____	_____
	MAP SPREAD DISTANCE, in	_____	_____	_____
6 PER	PERIMETER, ch	_____	_____	_____
7 AC	AREA, ac	_____	_____	_____
8 SPOT	MAX SPOTTING DIST, mi	_____	_____	_____
	MAP DISTANCE SPOT, in	_____	_____	_____
9 PIG	PROBABILITY OF IGNITION, %	<u>80</u>	_____	_____

SLOPE WORKSHEET

INPUT

0 PP	PROJECTION POINT	<u>A</u>	_____	_____
1 CON INT	CONTOUR INTERVAL, ft	<u>40</u>	_____	_____
2 SLC	MAP SCALE	<u>24000</u>	_____	_____
3 CF	CONVERSION FACTOR, ft/in	<u>2000</u>	_____	_____
4 # INTVLS	# OF CONTOUR INTERVALS	_____	_____	_____
5 RISE	RISE IN ELEVATION	<u>400</u>	_____	_____
6 MD	MAP DISTANCE, in (between points)	<u>45</u>	_____	_____
7 HZGD	HORIZONTAL GROUND DIST, ft	<u>900</u>	_____	_____

OUTPUT

1 SLP %	SLOPE, %	<u>45</u>	_____	_____
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NOMOGRAM VERSION - JUNE, 1993

FINE DEAD FUEL MOISTURE / PROBABILITY OF IGNITION WORKSHEET

INPUT

0 PP	PROJECTION POINT	<u>A</u>	<u>A'</u>	_____
1 D	DAY TIME CALCULATION	<u>D</u>	<u>D</u>	<u>D</u>
2 DB	DRY BULB TEMPERATURE, °F	<u>80</u>	<u>80</u>	_____
3 WB	WET BULB TEMPERATURE, °F	_____	_____	_____
4 DP	DEW POINT, °F	_____	_____	_____
5 RH	RELATIVE HUMIDITY, %	<u>15</u>	<u>15</u>	_____
6 RFM	REFERENCE FUEL MOISTURE, %	<u>2</u>	<u>2</u>	_____
	(TABLE 2)	_____	_____	_____
7 MO	MONTH	<u>7</u>	<u>7</u>	_____
8 SH	UNSHADED (U) OR SHADED (S)	<u>U/S</u>	<u>U/S</u>	<u>U/S</u>
9 T	TIME	<u>1400</u>	<u>1400</u>	_____
10 CH	ELEVATION CHANGE	<u>B/L/A</u>	<u>B/L/A</u>	<u>B/L/A</u>
	B = 1000' TO 2000' BELOW SITE	_____	_____	_____
	L = ±1000' OF SITE LOCATION	_____	_____	_____
	A = 1000' TO 2000' ABOVE SITE	_____	_____	_____
11 ASP	ASPECT, (N/E/S/W)	<u>N</u>	<u>N</u>	_____
12 SLP	SLOPE, %	<u>15</u>	<u>45</u>	_____
13 FMC	FUEL MOISTURE CORRECTION, %	<u>1</u>	<u>1</u>	_____
	(TABLE 3, 4, OR 5)	_____	_____	_____

OUTPUT

1 1H-FDFM	FINE DEAD FUEL MOISTURE, %	<u>3</u>	<u>3</u>	_____
	(line 6 + line 13)	_____	_____	_____
2 PIG	PROBABILITY OF IGNITION, %	<u>80</u>	<u>80</u>	_____
	(TABLE 12)	_____	_____	_____

WIND ADJUSTMENT WORKSHEET

INPUT

0 PP	PROJECTION POINT	<u>A</u>	<u>A'</u>	_____
1 20' W	20-FT WINDSPEED, mi/h	<u>10</u>	<u>20</u>	_____
2 MODEL #	FUEL MODEL NUMBER (1-13)	<u>10</u>	<u>10</u>	_____
3 SHLTR	WIND SHELTERING	<u>2</u>	<u>2</u>	_____
	1 = UNSHELTERED	_____	_____	_____
	2 = PARTIALLY SHELTERED	_____	_____	_____
	3 = FULLY SHELTERED, OPEN	_____	_____	_____
	4 = FULLY SHELTERED, CLOSED	_____	_____	_____
4 WAF	WIND ADJUSTMENT FACTOR	<u>.3</u>	<u>.3</u>	_____
	(TABLE 7)	_____	_____	_____

OUTPUT

1 MFWS	MIDFLAME WINDSPEED, mi/h	<u>3</u>	<u>6</u>	_____
	(line 1 x line 4)	_____	_____	_____

NAME OF FIRE _____ FIRE PRED SPEC _____

DATE _____ TIME _____

PROJ PERIOD DATE _____ PROJ TIME FROM _____ TO _____

SIZE WORKSHEET

INPUT

0 PP	PROJECTION POINT	_____	_____	_____
1 ROS	RATE OF SPREAD, ch/h	_____	_____	_____
2 EWS	EFFECTIVE WINDSPEED, mi/h	_____	_____	_____
3 PT	PROJECTION TIME, hr	_____	_____	_____
4 SD	SPREAD DISTANCE, ch	_____	_____	_____
	(line 1 x line 3 = line 4)			

OUTPUT

1 PER	PERIMETER, ch	_____	_____	_____
2 AC	AREA, ac	_____	_____	_____

MAP-SPREAD WORKSHEET

INPUT

0 PP	PROJECTION POINT	_____	_____	_____
1 ROS	RATE OF SPREAD, ch/h	_____	_____	_____
2 PT	PROJECTION TIME, hr	_____	_____	_____
3 SDCH	SPREAD DISTANCE, ch	_____	_____	_____
	(line 1 x line 2)			
4 SDFT	SPREAD DISTANCE, ft	_____	_____	_____
	(line 3 x 66 ft/ch)			
5 SCL	MAP SCALE	_____	_____	_____
6 CF	CONVERSION FACTOR, ft/in	_____	_____	_____
	(See map scale conversion)			

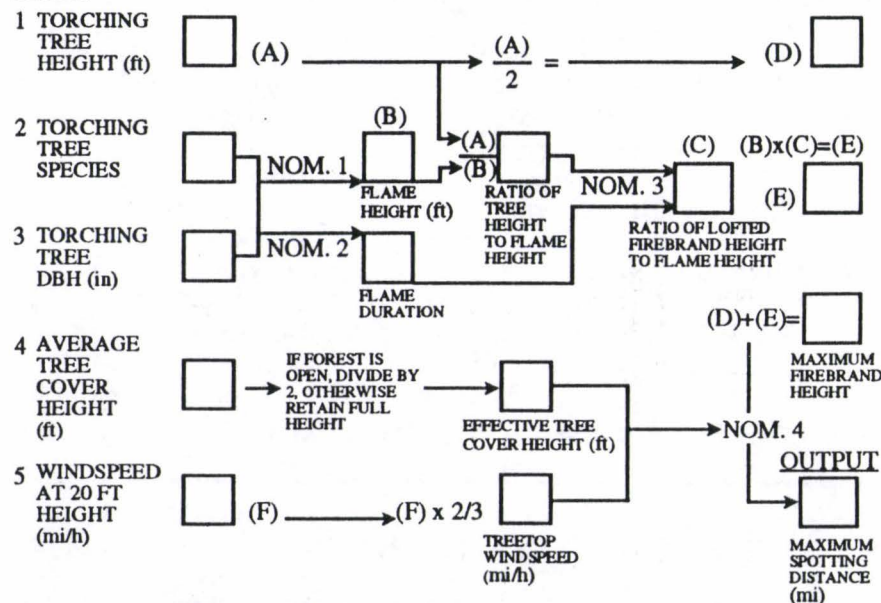
OUTPUT

1 MD	MAP SPREAD DISTANCE, in	_____	_____	_____
	(line 4 divided by line 6)			

NOMOGRAM VERSION - JUNE, 1993

SPOTTING WORKSHEET

INPUT



MAP-SPOT WORKSHEET

INPUT

0 PP	PROJECTION POINT	_____	_____	_____
1 SPOTMI	SPOTTING DISTANCE, mi	_____	_____	_____
2 SPOTFT	SPOTTING DISTANCE, ft	_____	_____	_____
	(line 1 x 5,280 ft)			
3 SCL	MAP SCALE	_____	_____	_____
4 CF	CONVERSION FACTOR, ft/in	_____	_____	_____

OUTPUT

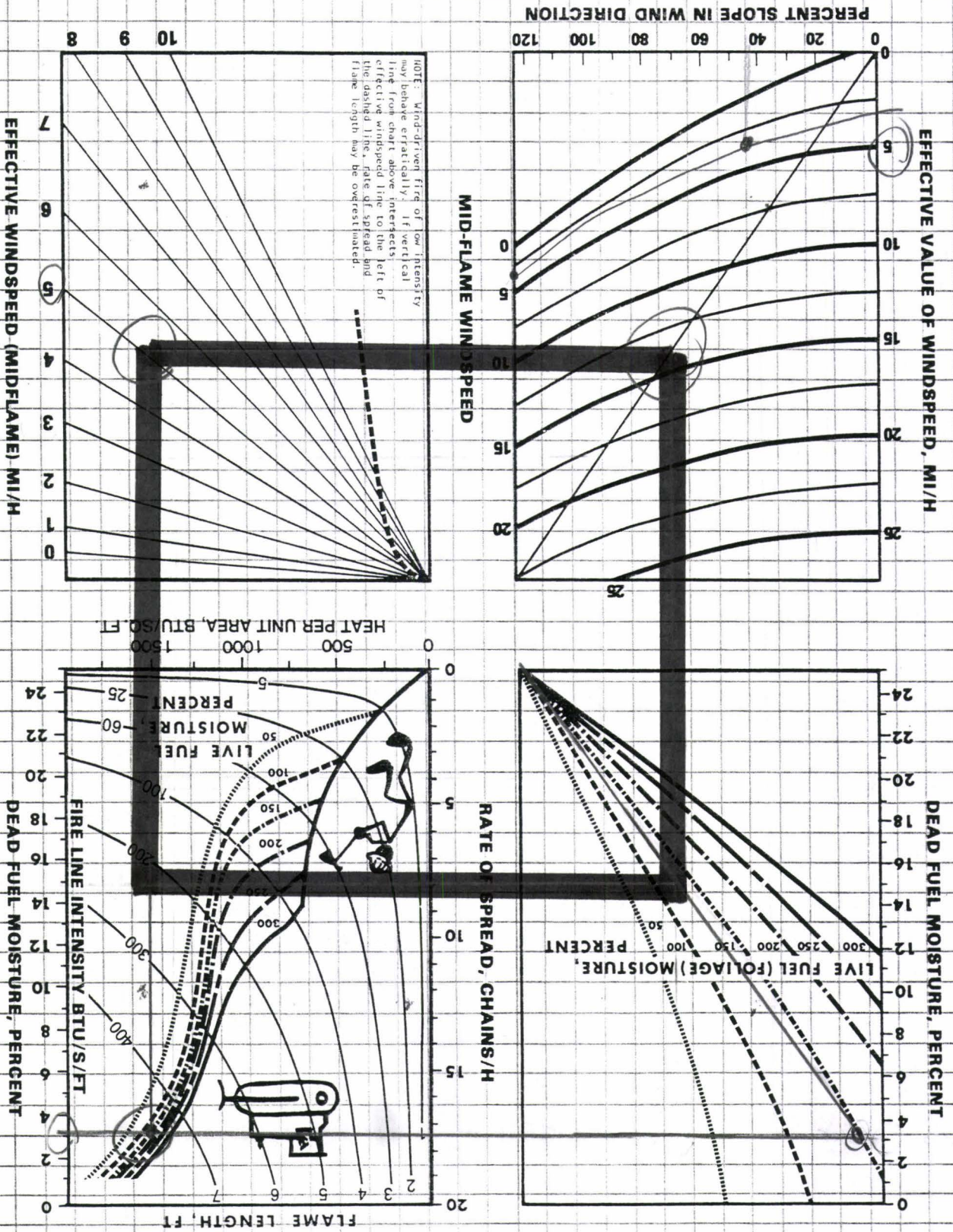
1 SPOT	MAP DISTANCE SPOT, in	_____	_____	_____
	(line 2 divided by line 4)			

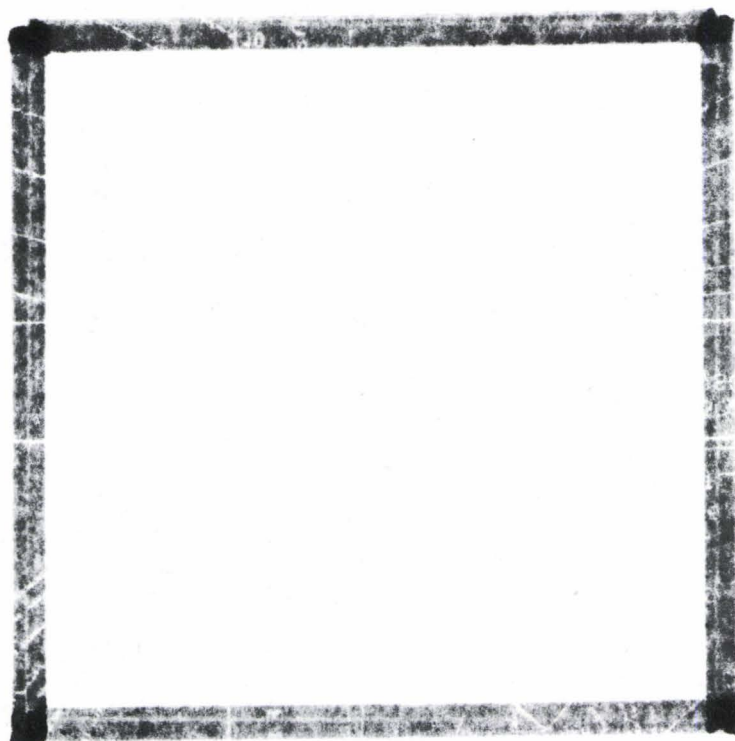
NOTES:

Example 4

Fuel model 10 - low windspeeds

10. TIMBER (LITTER & UNDERSTORY) - LOW WINDSPEEDS

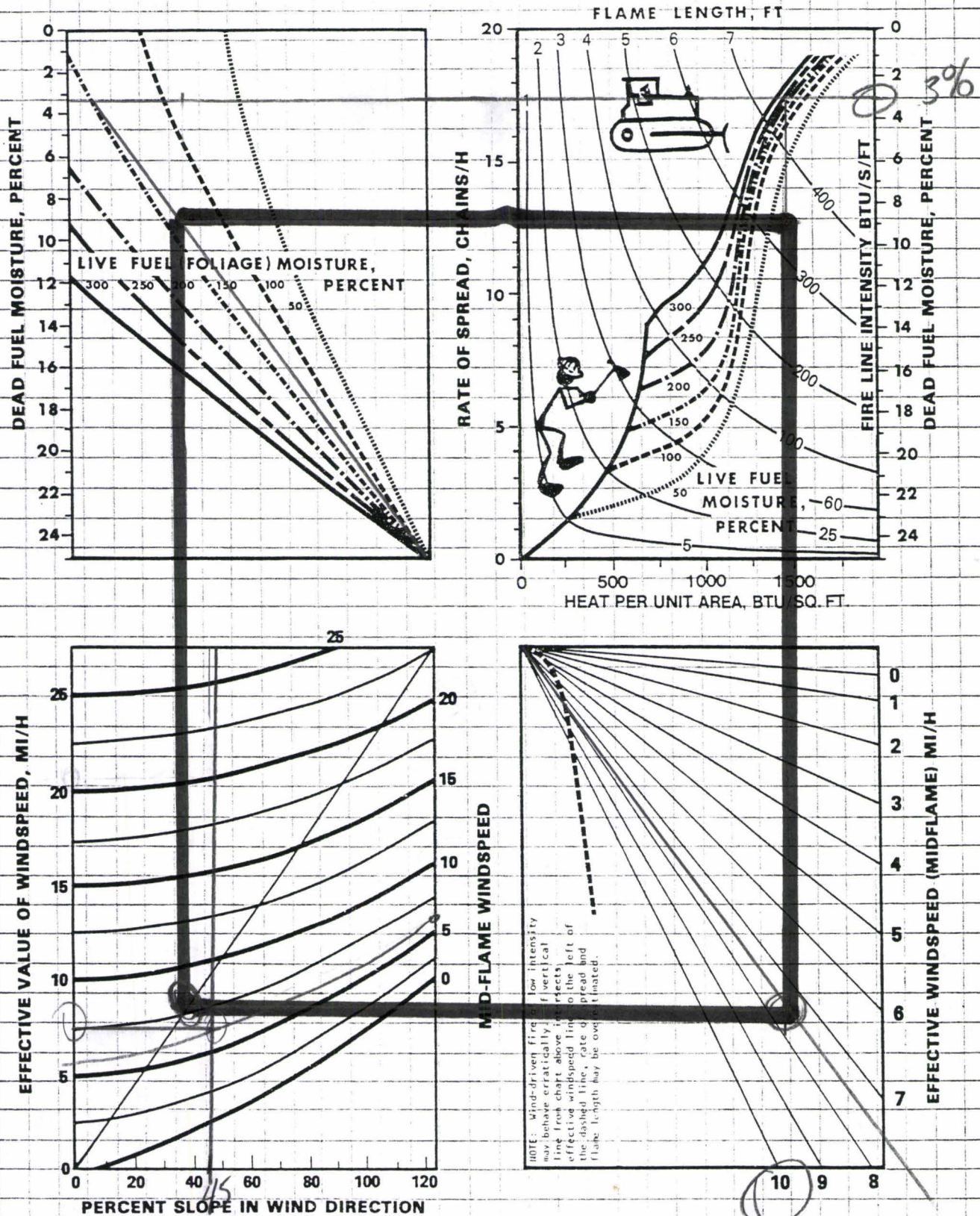


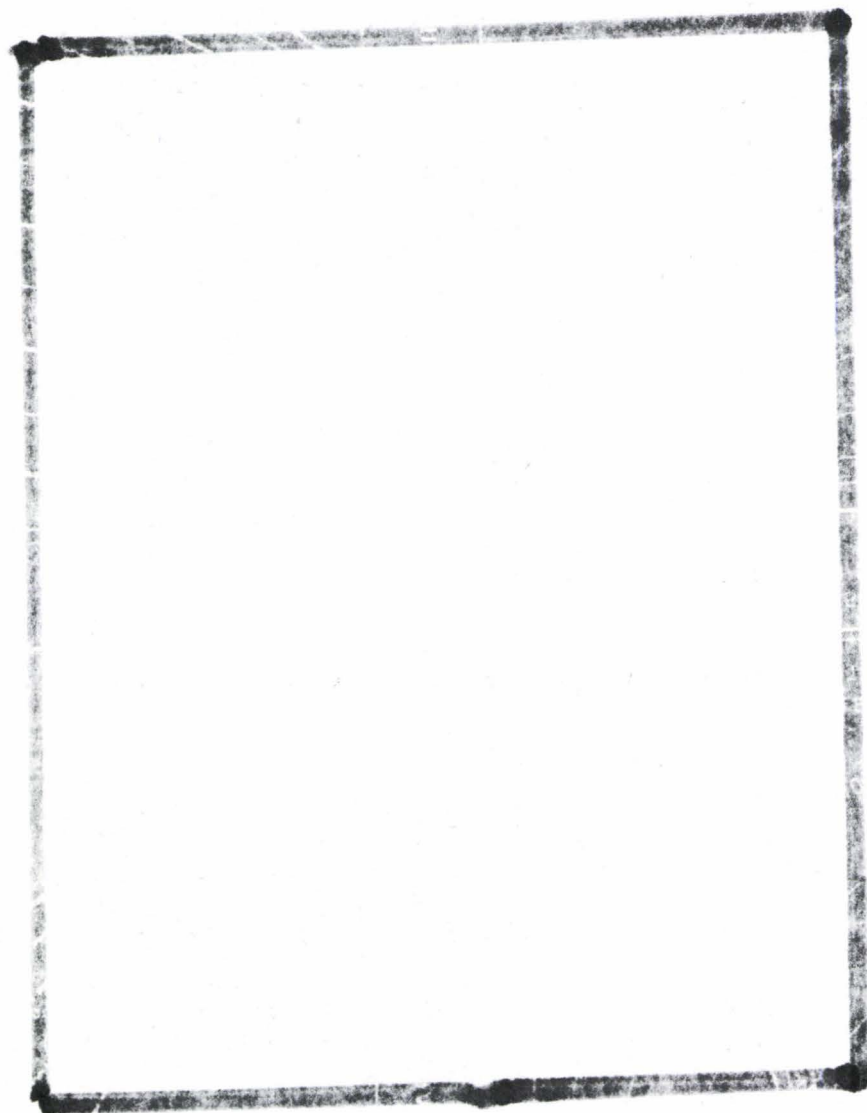


Example A'

Fuel model 10 - low windspeeds

10. TIMBER (LITTER & UNDERSTORY) - LOW WINDSPEEDS





NAME OF FIRE Shrub FIRE PRED SPEC _____
 DATE 7/1/94 TIME 14:00
 PROJ PERIOD DATE _____ PROJ TIME FROM _____ TO _____

FIRE BEHAVIOR WORKSHEET

INPUT

0 PP	PROJECTION POINT	<u>B</u>	<u>B'</u>	_____
1 MODEL #	FUEL MODEL NUMBER (1-13)	<u>6</u>	<u>6</u>	_____
2 1H-FDFM	FINE DEAD FUEL MOISTURE, %	<u>2</u>	<u>2</u>	_____
3 LFM	LIVE FUEL MOISTURE, %	<u>NA</u>	<u>NA</u>	_____
4 MFWS	MIDFLAME WINDSPEED, mi/h	<u>4</u>	<u>8</u>	_____
5 SLP	SLOPE, %	<u>25</u>	<u>25</u>	_____
6 EWS	EFFECTIVE WINDSPEED, mi/h	<u>5</u>	<u>9</u>	_____

OUTPUT

1 ROS	RATE OF SPREAD, ch/h	<u>50</u>	<u>100</u>	_____
2 HA	HEAT PER UNIT AREA, Btu/sq ft	<u>600</u>	<u>600</u>	_____
3 FLI	FIRELINE INTENSITY, Btu/ft/s	<u>525</u>	<u>1200</u>	_____
4 FL	FLAME LENGTH, ft	<u>8</u>	<u>11+</u>	_____
5 SD	SPREAD DISTANCE, ch	_____	_____	_____
	MAP SPREAD DISTANCE, in	_____	_____	_____
6 PER	PERIMETER, ch	_____	_____	_____
7 AC	AREA, ac	_____	_____	_____
8 SPOT	MAX SPOTTING DIST, mi	_____	_____	_____
	MAP DISTANCE SPOT, in	_____	_____	_____
9 PIG	PROBABILITY OF IGNITION, %	_____	_____	_____

SLOPE WORKSHEET

INPUT

0 PP	PROJECTION POINT	_____	_____	_____
1 CON INT	CONTOUR INTERVAL, ft	_____	_____	_____
2 SLC	MAP SCALE	_____	_____	_____
3 CF	CONVERSION FACTOR, ft/in	_____	_____	_____
4 #INTVLS	# OF CONTOUR INTERVALS	_____	_____	_____
5 RISE	RISE IN ELEVATION	_____	_____	_____
6 MD	MAP DISTANCE, in (between points)	_____	_____	_____
7 HZGD	HORIZONTAL GROUND DIST, ft	_____	_____	_____

OUTPUT

1 SLP %	SLOPE, %	_____	_____	_____
---------	----------	-------	-------	-------

FINE DEAD FUEL MOISTURE / PROBABILITY OF IGNITION WORKSHEET

INPUT

0 PP	PROJECTION POINT	<u>B</u>	<u>B'</u>	_____
1 D	DAY TIME CALCUALTION	<u>D</u>	<u>D</u>	<u>D</u>
2 DB	DRY BULB TEMPERATURE, °F	<u>80</u>	<u>80</u>	_____
3 WB	WET BULB TEMPERATURE, °F	_____	_____	_____
4 DP	DEW POINT, °F	_____	_____	_____
5 RH	RELATIVE HUMIDITY, %	<u>15</u>	<u>15</u>	_____
6 RFM	REFERENCE FUEL MOISTURE, %	<u>2</u>	<u>2</u>	_____
	(TABLE 2)			
7 MO	MONTH	<u>7</u>	<u>7</u>	_____
8 SH	UNSHADED (U) OR SHADED (S)	<u>U/S</u>	<u>U/S</u>	<u>U/S</u>
9 T	TIME	<u>1400</u>	<u>1400</u>	_____
10 CH	ELEVATION CHANGE	<u>B/L/A</u>	<u>B/L/A</u>	<u>B/L/A</u>
	B = 1000' TO 2000' BELOW SITE			
	L = ±1000' OF SITE LOCATION			
	A = 1000' TO 2000' ABOVE SITE			
11 ASP	ASPECT, (N/E/S/W)	<u>E</u>	<u>E</u>	_____
12 SLP	SLOPE, %	<u>25</u>	<u>25</u>	_____
13 FMC	FUEL MOISTURE CORRECTION, %	<u>0</u>	<u>0</u>	_____
	(TABLE 3, 4, OR 5)			

OUTPUT

1 1H-FDFM	FINE DEAD FUEL MOISTURE, %	<u>2</u>	<u>2</u>	_____
	(line 6 + line 13)			
2 PIG	PROBABILITY OF IGNITION, %	<u>100</u>	<u>100</u>	_____
	(TABLE 12)			

WIND ADJUSTMENT WORKSHEET

INPUT

0 PP	PROJECTION POINT	_____	_____	_____
1 20' W	20-FT WINDSPEED, mi/h	<u>10</u>	<u>20</u>	_____
2 MODEL #	FUEL MODEL NUMBER (1-13)	<u>6</u>	<u>6</u>	_____
3 SHLTR	WIND SHELTERING	<u>1</u>	<u>1</u>	_____
	1 = UNSHELTERED			
	2 = PARTIALLY SHELTERED			
	3 = FULLY SHELTERED, OPEN			
	4 = FULLY SHELTERED, CLOSED			
4 WAF	WIND ADJUSTMENT FACTOR	<u>.4</u>	<u>.4</u>	_____
	(TABLE 7)			

OUTPUT

1 MFWS	MIDFLAME WINDSPEED, mi/h	<u>4</u>	<u>8</u>	_____
	(line 1 x line 4)			

NAME OF FIRE _____ FIRE PRED SPEC _____

DATE _____ TIME _____

PROJ PERIOD DATE _____ PROJ TIME FROM _____ TO _____

SIZE WORKSHEET**INPUT**

- 0 PP PROJECTION POINT _____
- 1 ROS RATE OF SPREAD, ch/h _____
- 2 EWS EFFECTIVE WINDSPEED, mi/h _____
- 3 PT PROJECTION TIME, hr _____
- 4 SD SPREAD DISTANCE, ch _____
(line 1 x line 3 = line 4)

OUTPUT

- 1 PER PERIMETER, ch _____
- 2 AC AREA, ac _____

MAP-SPREAD WORKSHEET**INPUT**

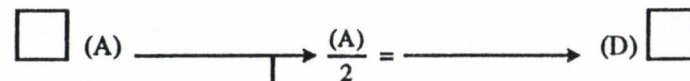
- 0 PP PROJECTION POINT _____
- 1 ROS RATE OF SPREAD, ch/h _____
- 2 PT PROJECTION TIME, hr _____
- 3 SDCH SPREAD DISTANCE, ch _____
(line 1 x line 2)
- 4 SDFt SPREAD DISTANCE, ft _____
(line 3 x 66 ft/ch)
- 5 SCL MAP SCALE _____
- 6 CF CONVERSION FACTOR, ft/in _____
(See map scale conversion)

OUTPUT

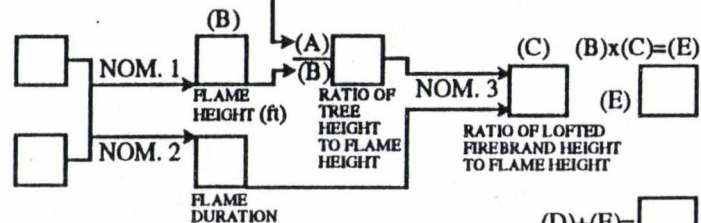
- 1 MD MAP SPREAD DISTANCE, in _____
(line 4 divided by line 6)

SPOTTING WORKSHEET**INPUT**

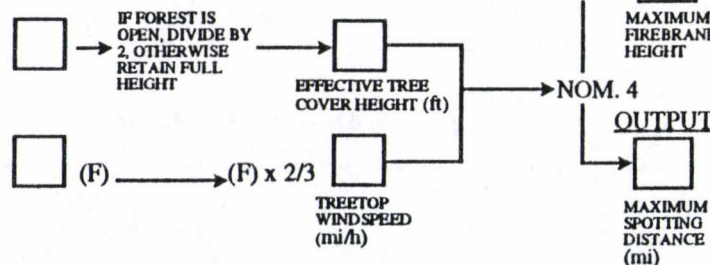
- 1 TORCHING
TREE
HEIGHT (ft)



- 2 TORCHING
TREE
SPECIES



- 4 AVERAGE
TREE
COVER
HEIGHT
(ft)



- 5 WINDSPEED
AT 20 FT
HEIGHT
(mi/h)

MAP-SPOT WORKSHEET**INPUT**

- 0 PP PROJECTION POINT _____
- 1 SPOTMI SPOTTING DISTANCE, mi _____
- 2 SPOTFT SPOTTING DISTANCE, ft _____
(line 1 x 5,280 ft)
- 3 SCL MAP SCALE _____
- 4 CF CONVERSION FACTOR, ft/in _____

OUTPUT

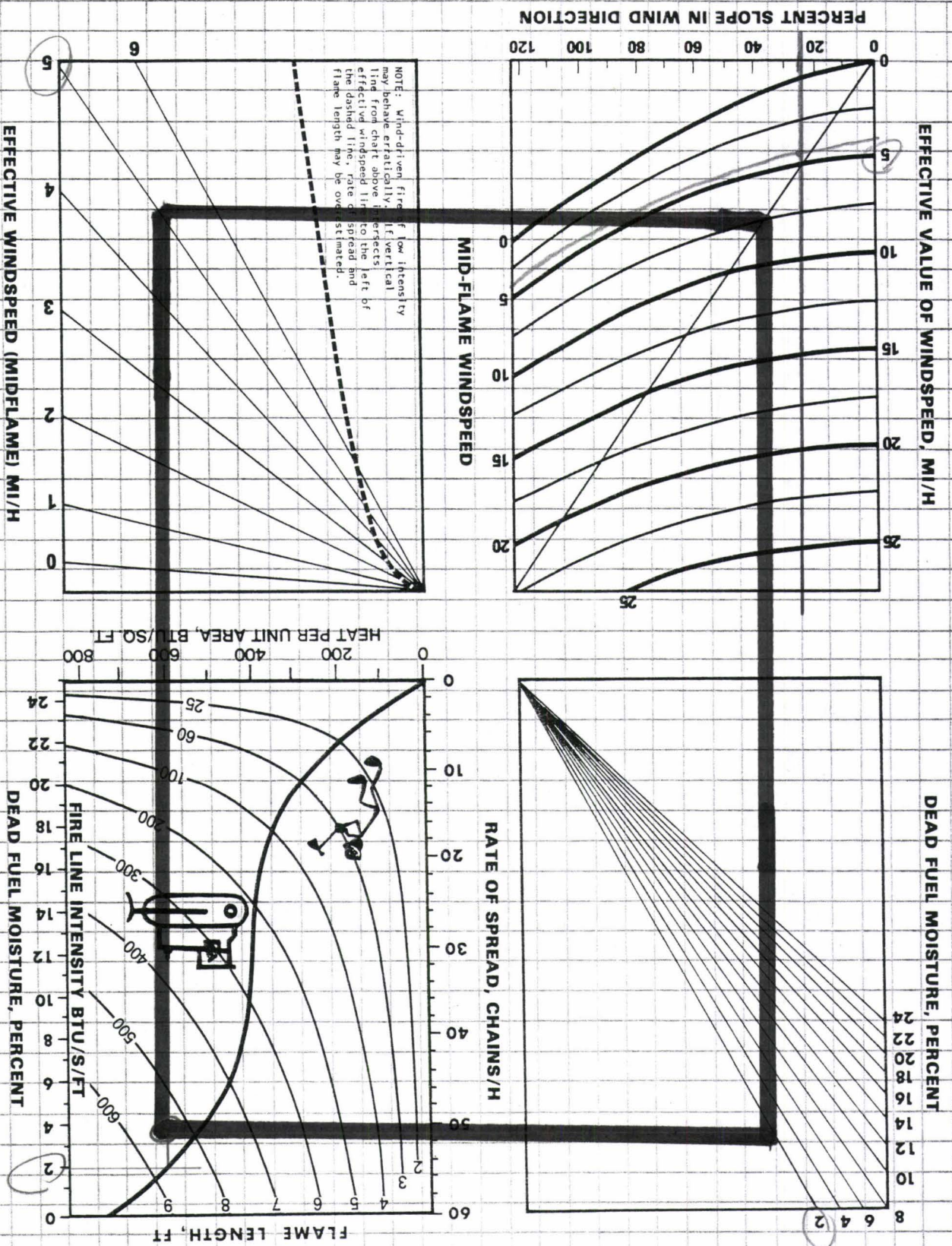
- 1 SPOT MAP DISTANCE SPOT, in _____
(line 2 divided by line 4)

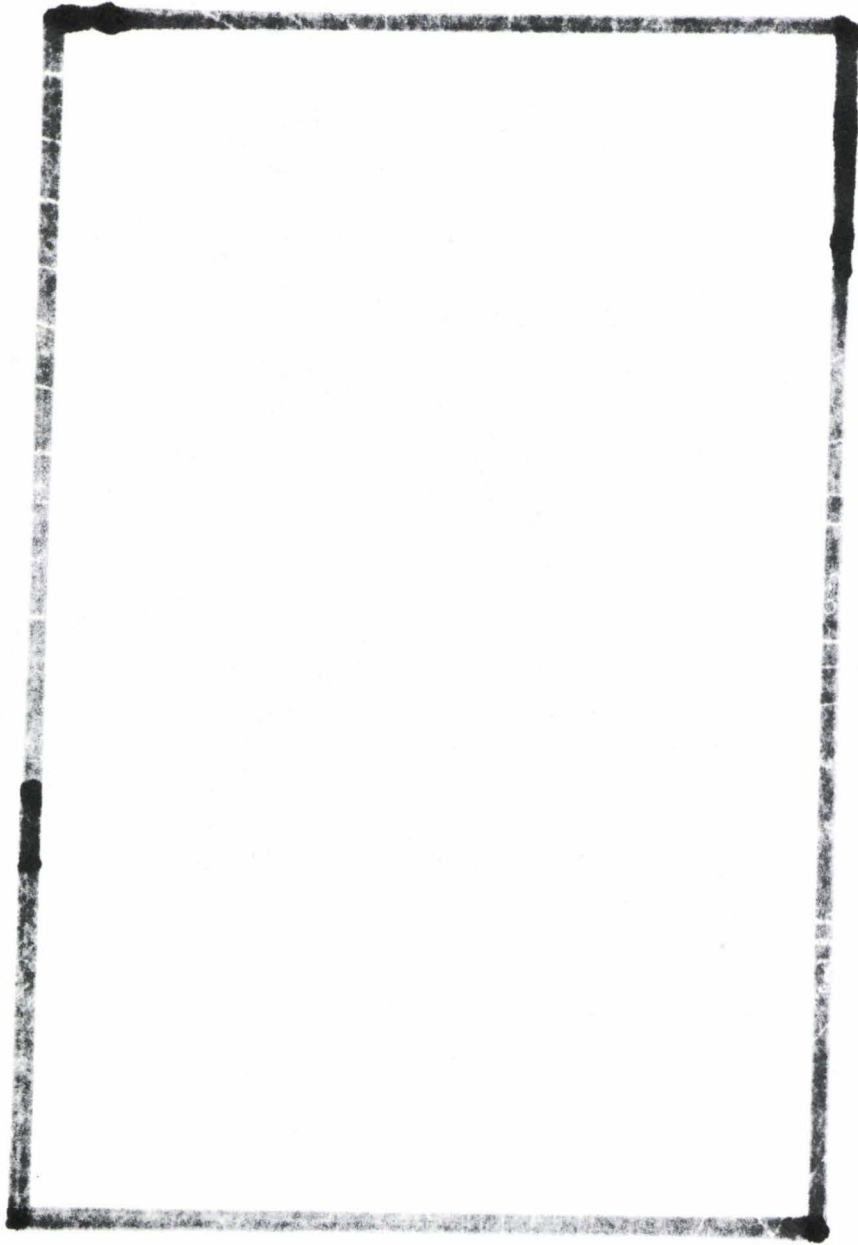
NOTES:

Example B

Fuel model 6 - low windspeeds

6. DORMANT BRUSH, HARDWOOD SLASH - LOW WINDSPEEDS

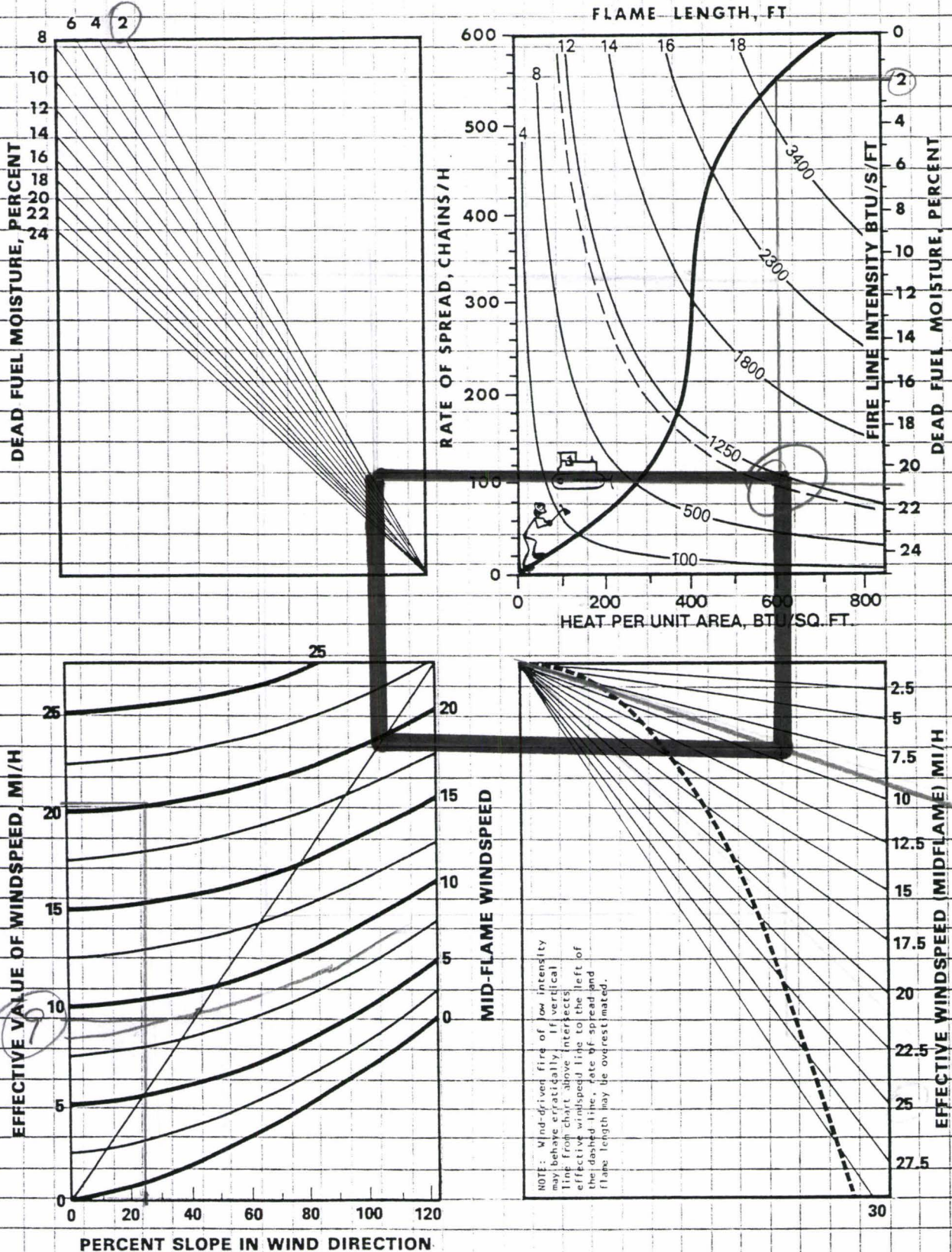




Example B'

Fuel model 6 - high windspeeds

6. DORMANT BRUSH, HARDWOOD SLASH-HIGH WINDSPEEDS





Appendix 2

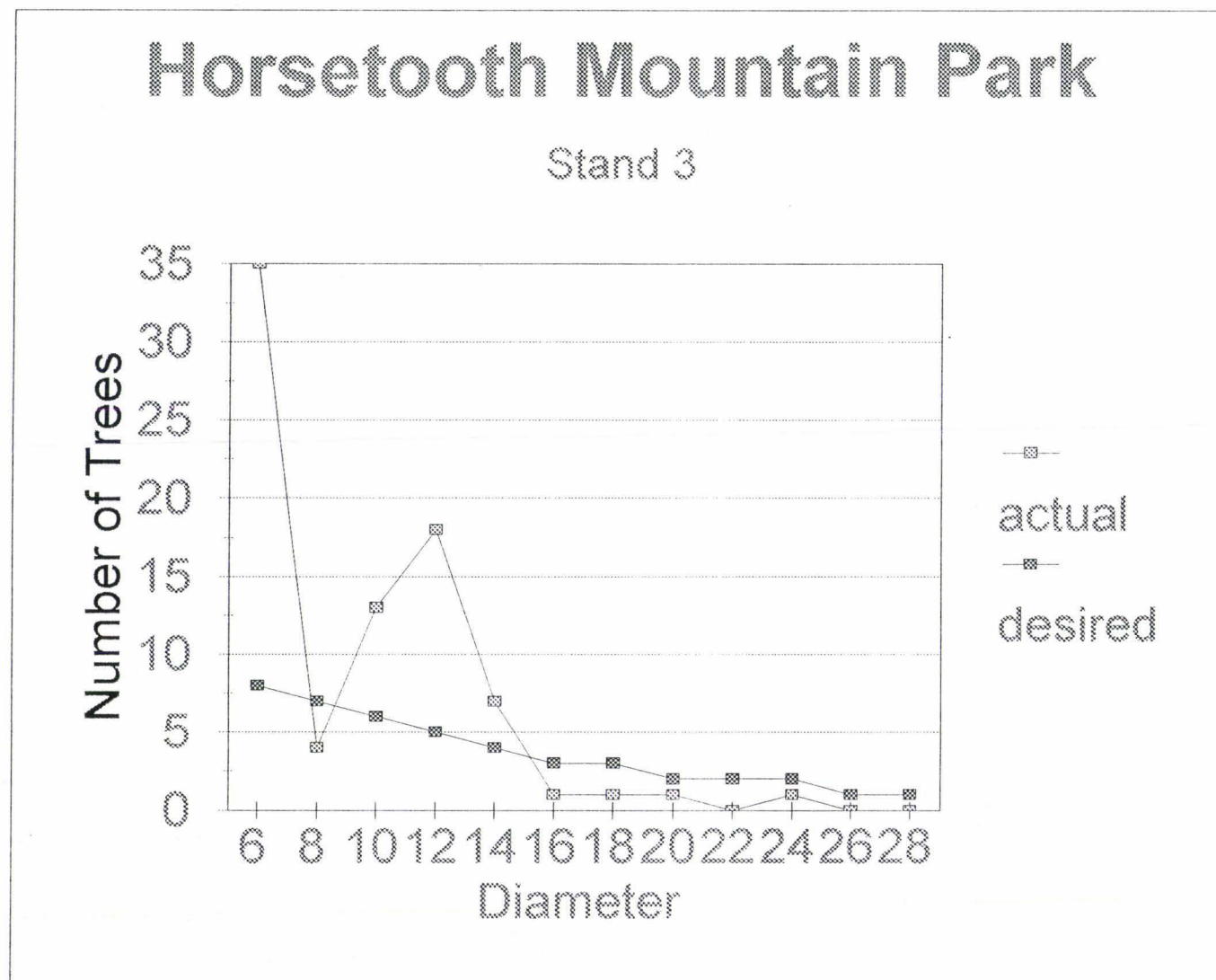
Insect and Disease Information

Appendix 3

Stand Comparison Charts

Stand 3

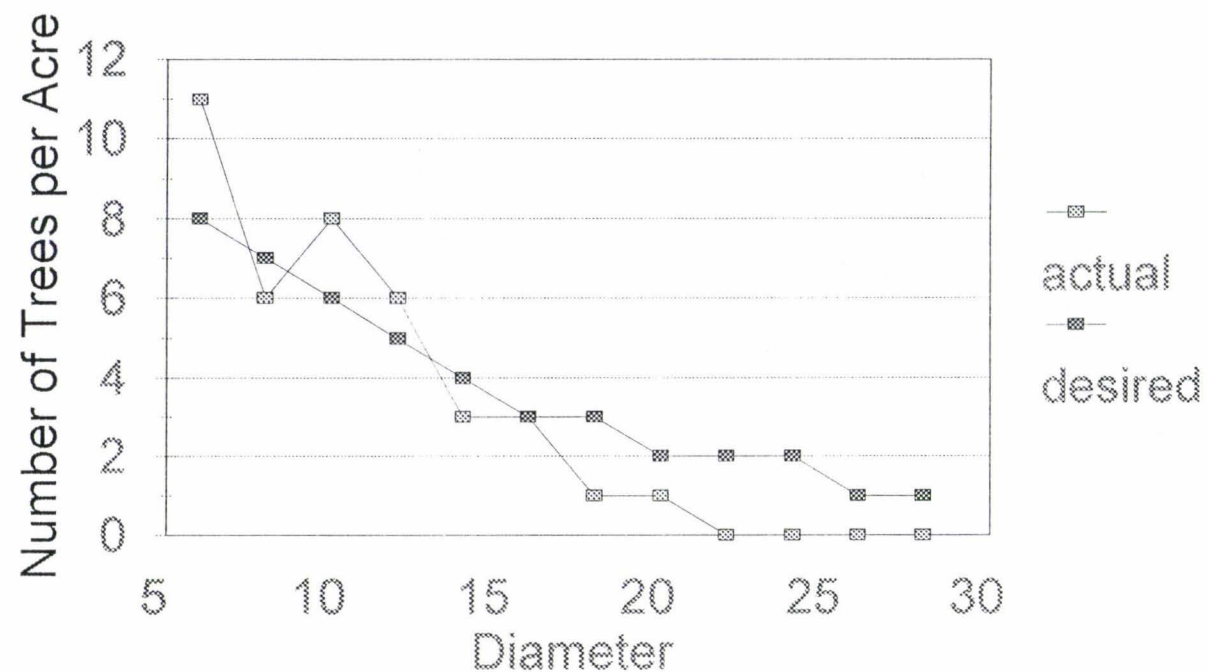
DBH	actual	desired
6	35	8
8	4	7
10	13	6
12	18	5
14	7	4
16	1	3
18	1	3
20	1	2
22	0	2
24	1	2
26	0	1
28	0	1



Stand 5		
DBH	actual	desired
6	11	8
8	6	7
10	8	6
12	6	5
14	3	4
16	3	3
18	1	3
20	1	2
22	0	2
24	0	2
26	0	1
28	0	1

Horsetooth Mountain Park

Stand 5

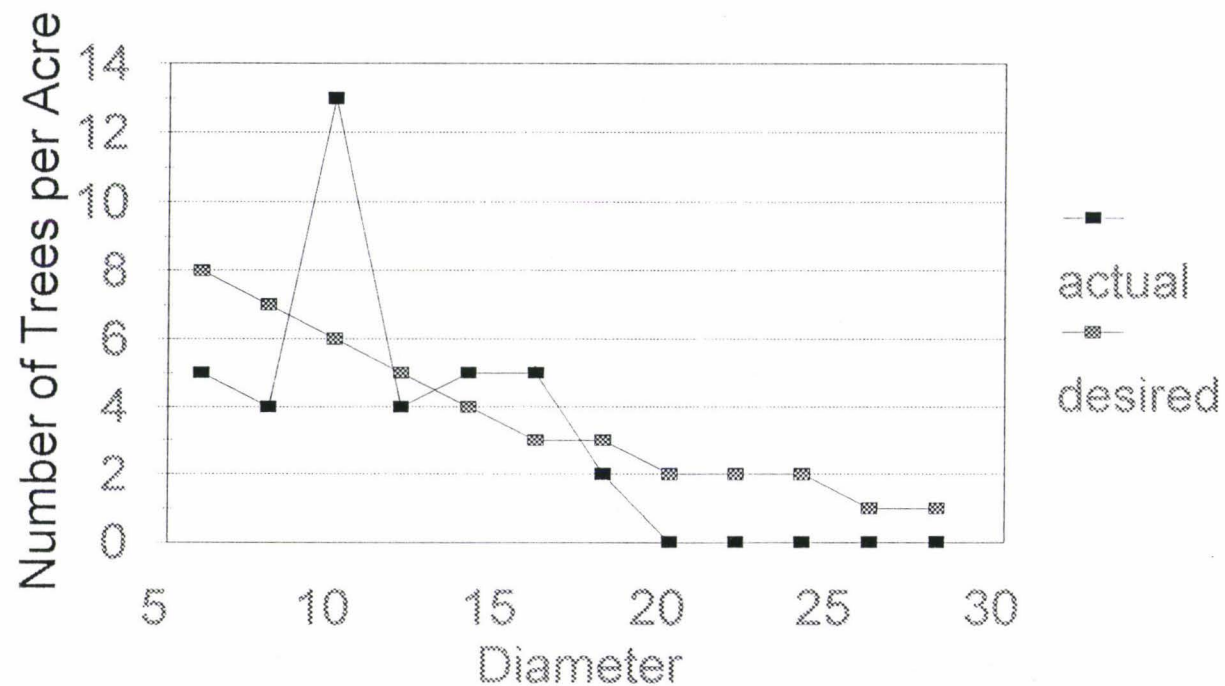


Stand 7

DBH	actual	desired
6	5	8
8	4	7
10	13	6
12	4	5
14	5	4
16	5	3
18	2	3
20	0	2
22	0	2
24	0	2
26	0	1
28	0	1

Horsetooth Mountain Park

Stand 7

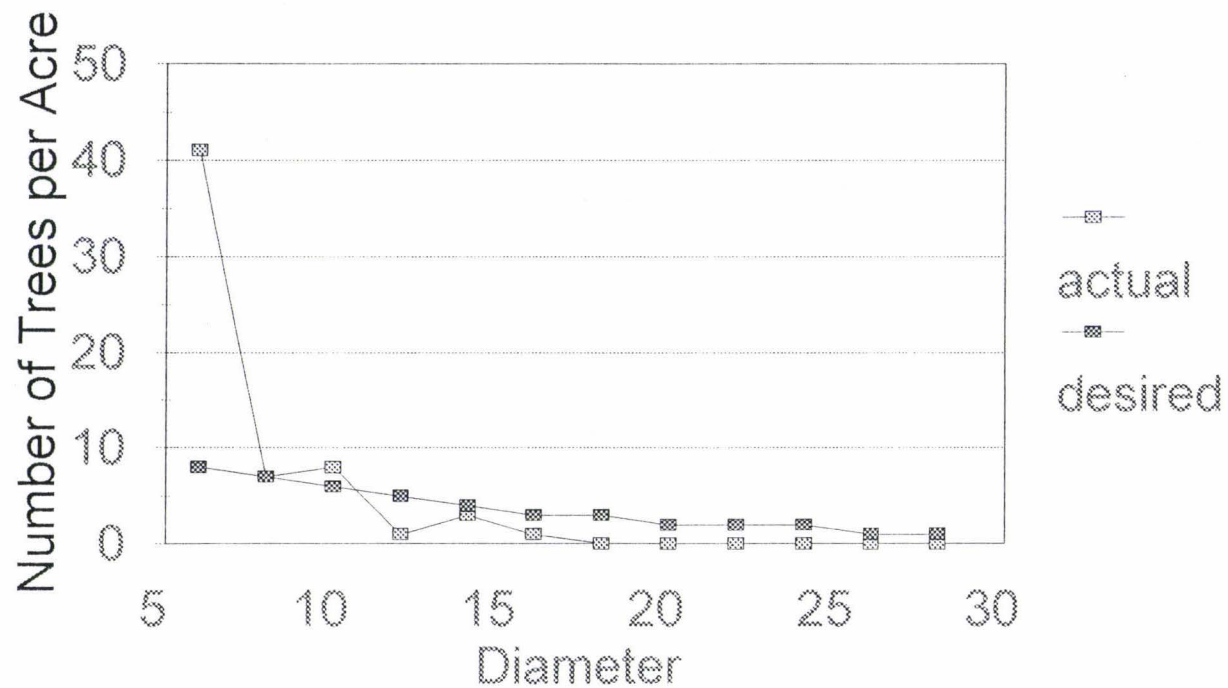


Stand 9

DBH	actual	desired
6	41	8
8	7	7
10	8	6
12	1	5
14	3	4
16	1	3
18	0	3
20	0	2
22	0	2
24	0	2
26	0	1
28	0	1

Horsetooth Mountain Park

Stand 9

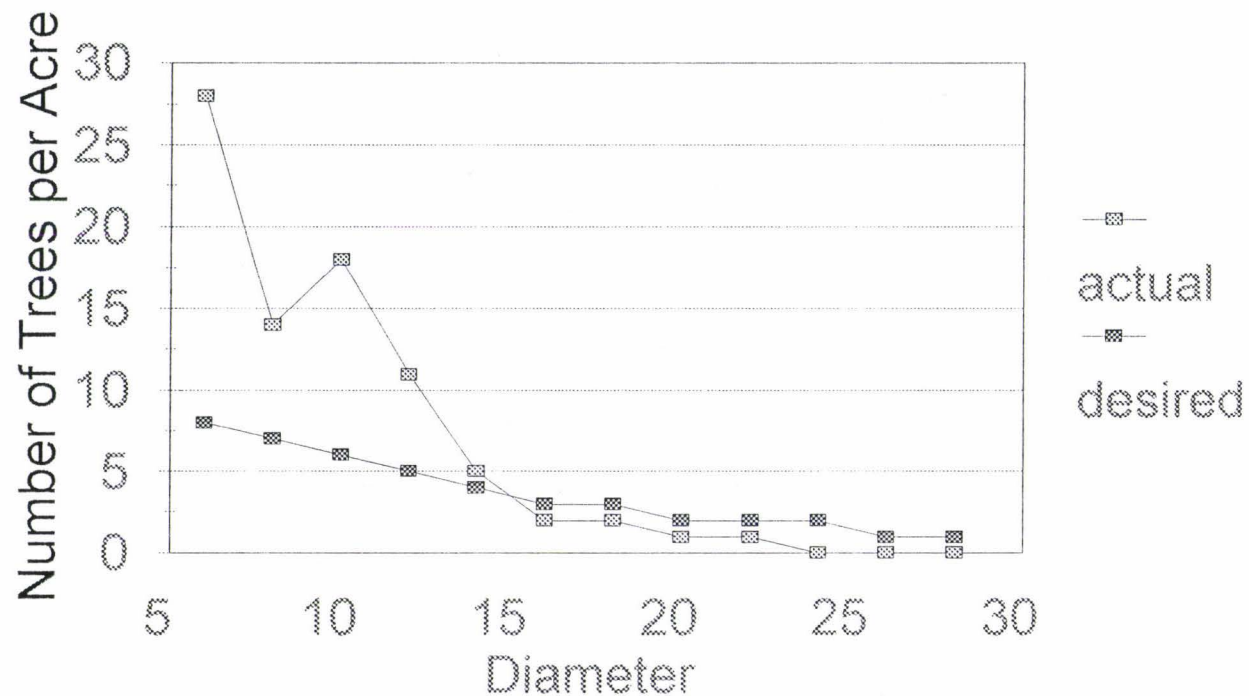


Stand 11

DBH	actual	desired
6	28	8
8	14	7
10	18	6
12	11	5
14	5	4
16	2	3
18	2	3
20	1	2
22	1	2
24	0	2
26	0	1
28	0	1

Horsetooth Mountain Park

Stand 11

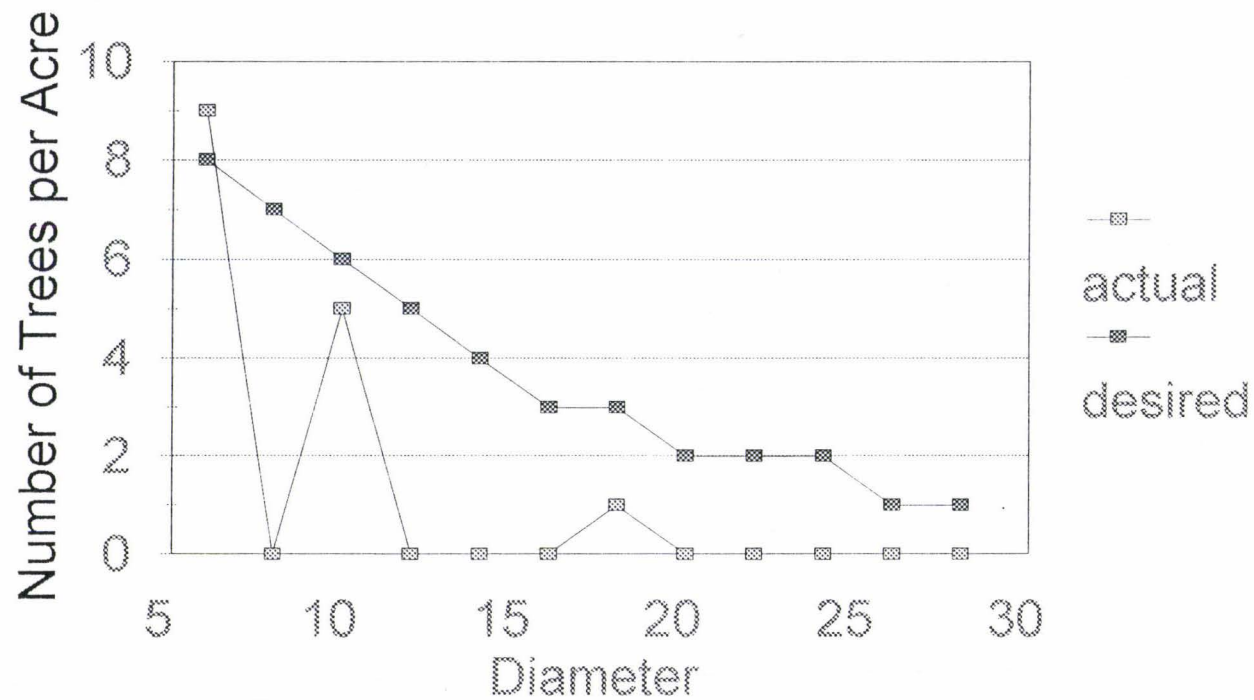


Stand 13

DBH	actual	desired
6	9	8
8	0	7
10	5	6
12	0	5
14	0	4
16	0	3
18	1	3
20	0	2
22	0	2
24	0	2
26	0	1
28	0	1

Horsetooth Mountain Park

Stand 13

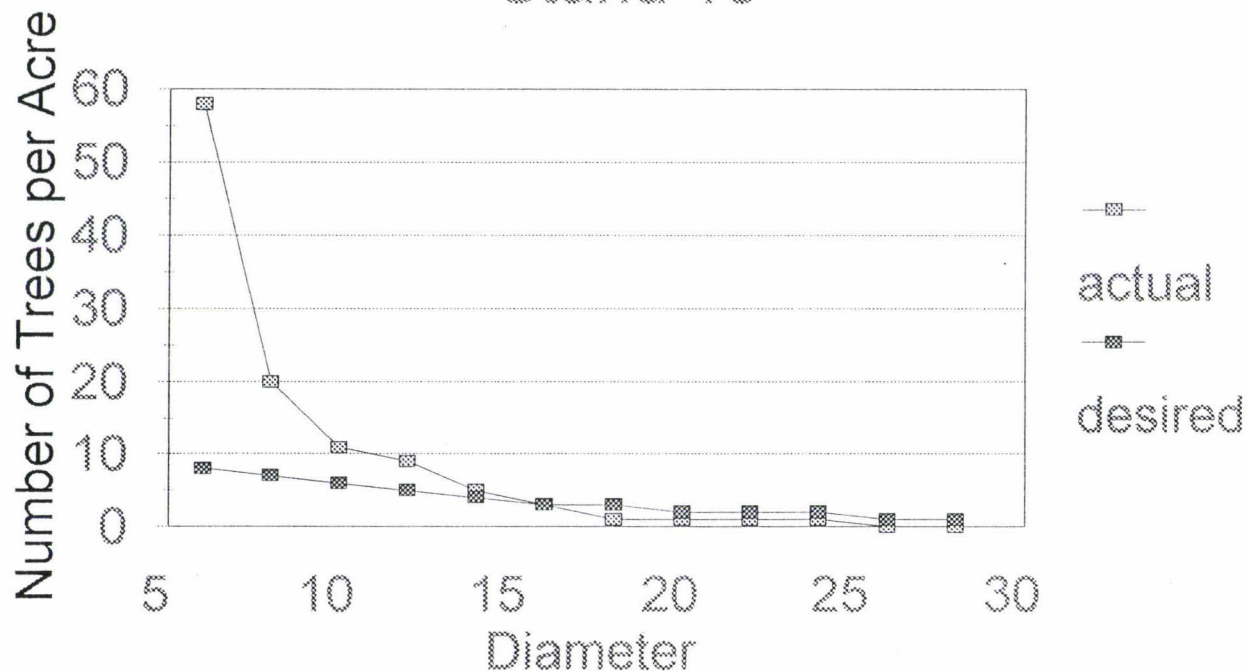


Stand 15

DBH	actual	desired
6	58	8
8	20	7
10	11	6
12	9	5
14	5	4
16	3	3
18	1	3
20	1	2
22	1	2
24	1	2
26	0	1
28	0	1

Horsetooth Mountain Park

Stand 15

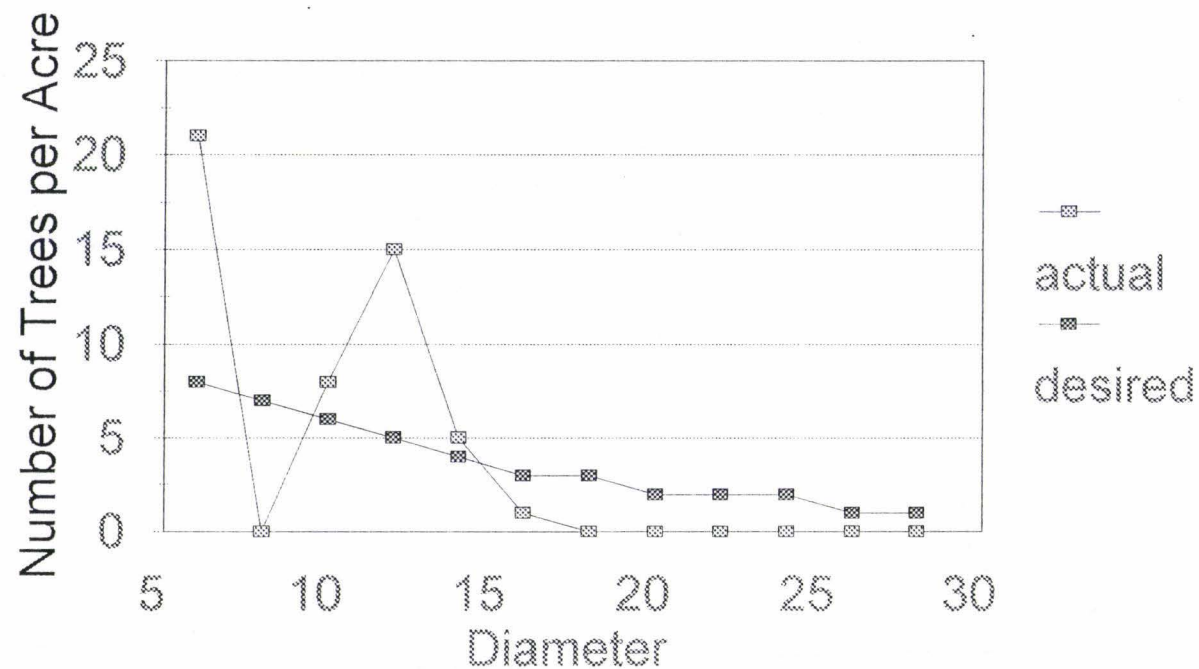


Stand 17

DBH	actual	desired
6	21	8
8	0	7
10	8	6
12	15	5
14	5	4
16	1	3
18	0	3
20	0	2
22	0	2
24	0	2
26	0	1
28	0	1

Horsetooth Mountain Park

Stand 17

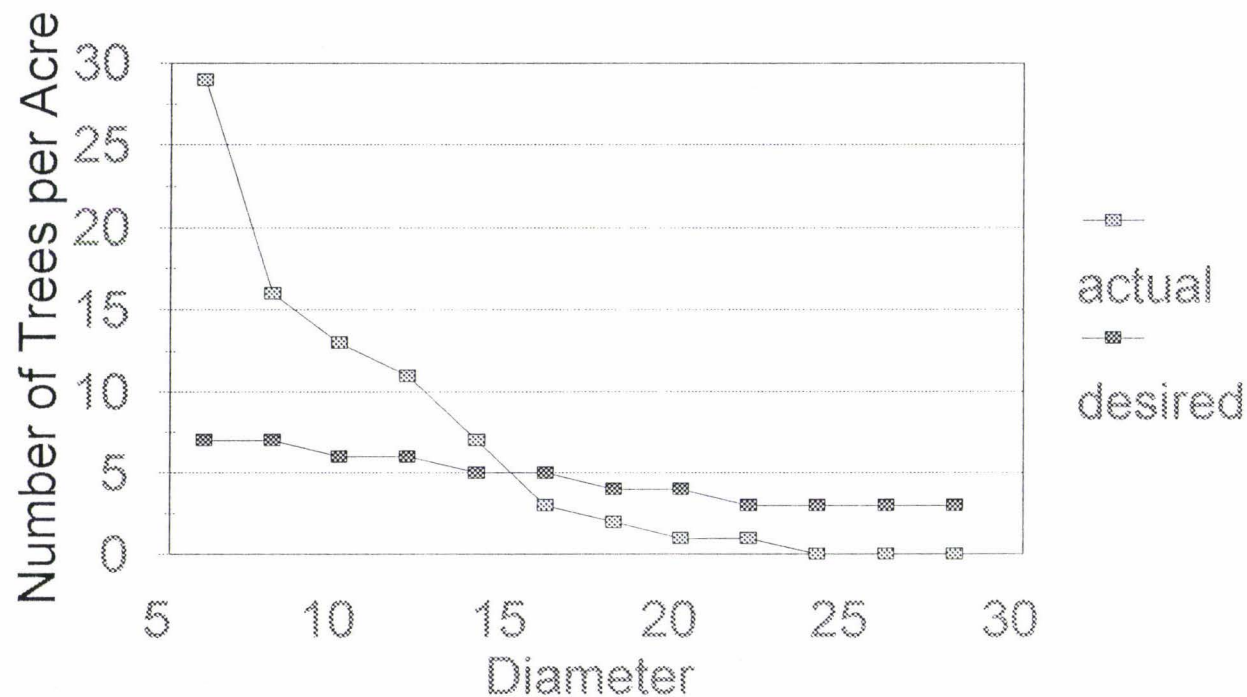


Stand 19

DBH	actual	desired
6	29	7
8	16	7
10	13	6
12	11	6
14	7	5
16	3	5
18	2	4
20	1	4
22	1	3
24	0	3
26	0	3
28	0	3

Horsetooth Mountain Park

Stand 19

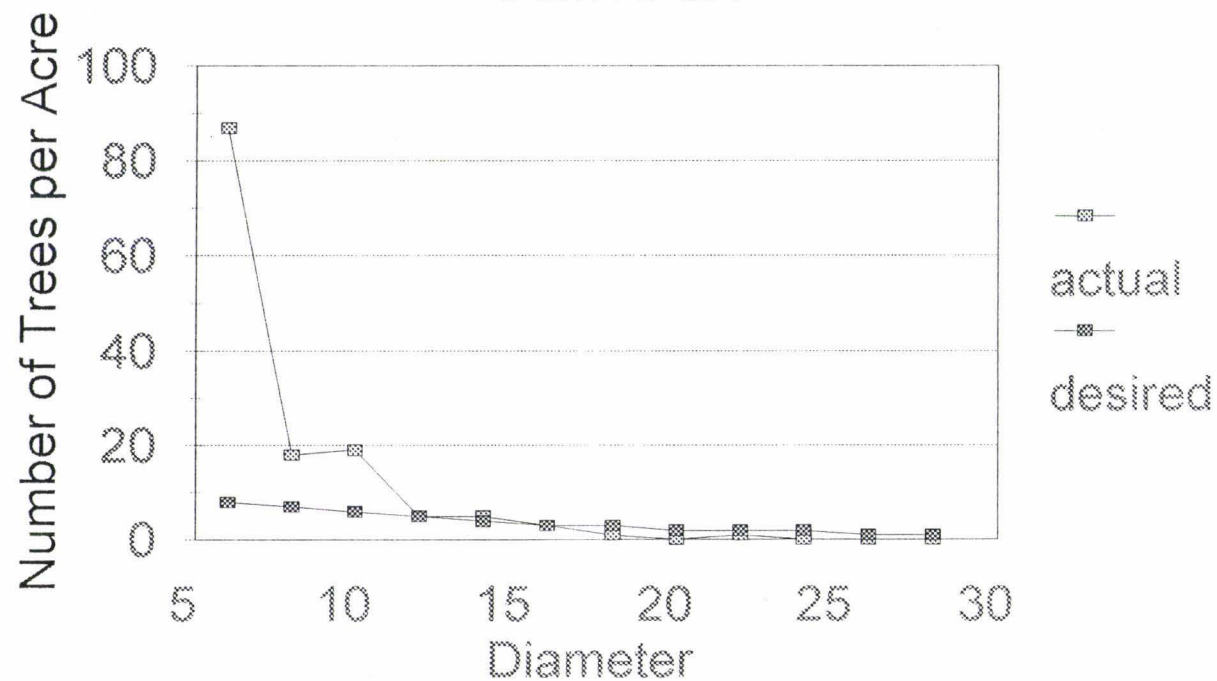


Stand 21

DBH	actual	desired
6	87	8
8	18	7
10	19	6
12	5	5
14	5	4
16	3	3
18	1	3
20	0	2
22	1	2
24	0	2
26	0	1
28	0	1

Horsetooth Mountain Park

Stand 21



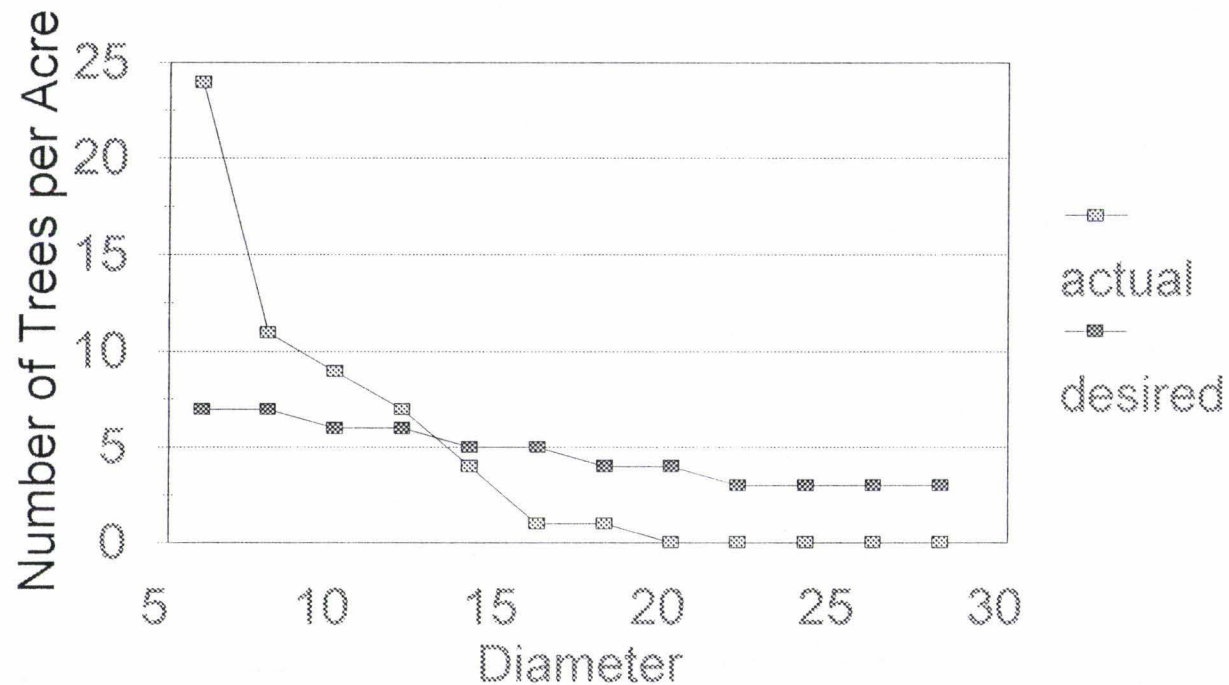


Stand 23

DBH	actual	desired
6	24	7
8	11	7
10	9	6
12	7	6
14	4	5
16	1	5
18	1	4
20	0	4
22	0	3
24	0	3
26	0	3
28	0	3

Horsetooth Mountain Park

Stand 23

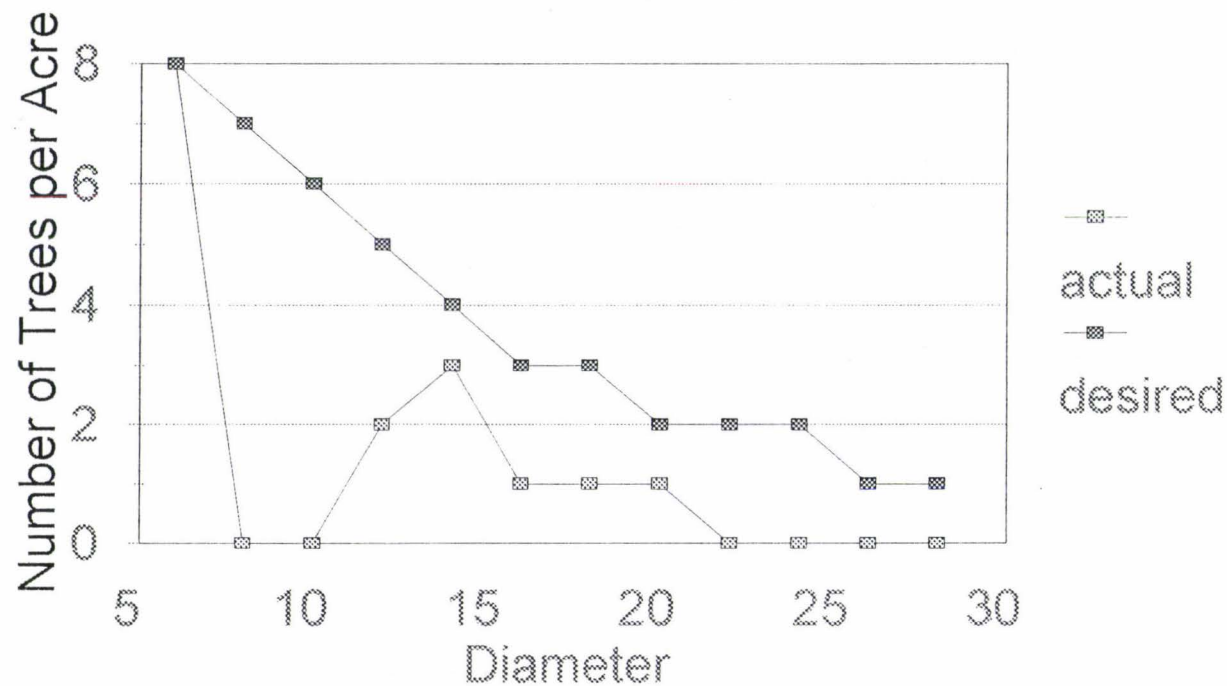


Stand 25

DBH	actual	desired
6	8	8
8	0	7
10	0	6
12	2	5
14	3	4
16	1	3
18	1	3
20	1	2
22	0	2
24	0	2
26	0	1
28	0	1

Horsetooth Mountain Park

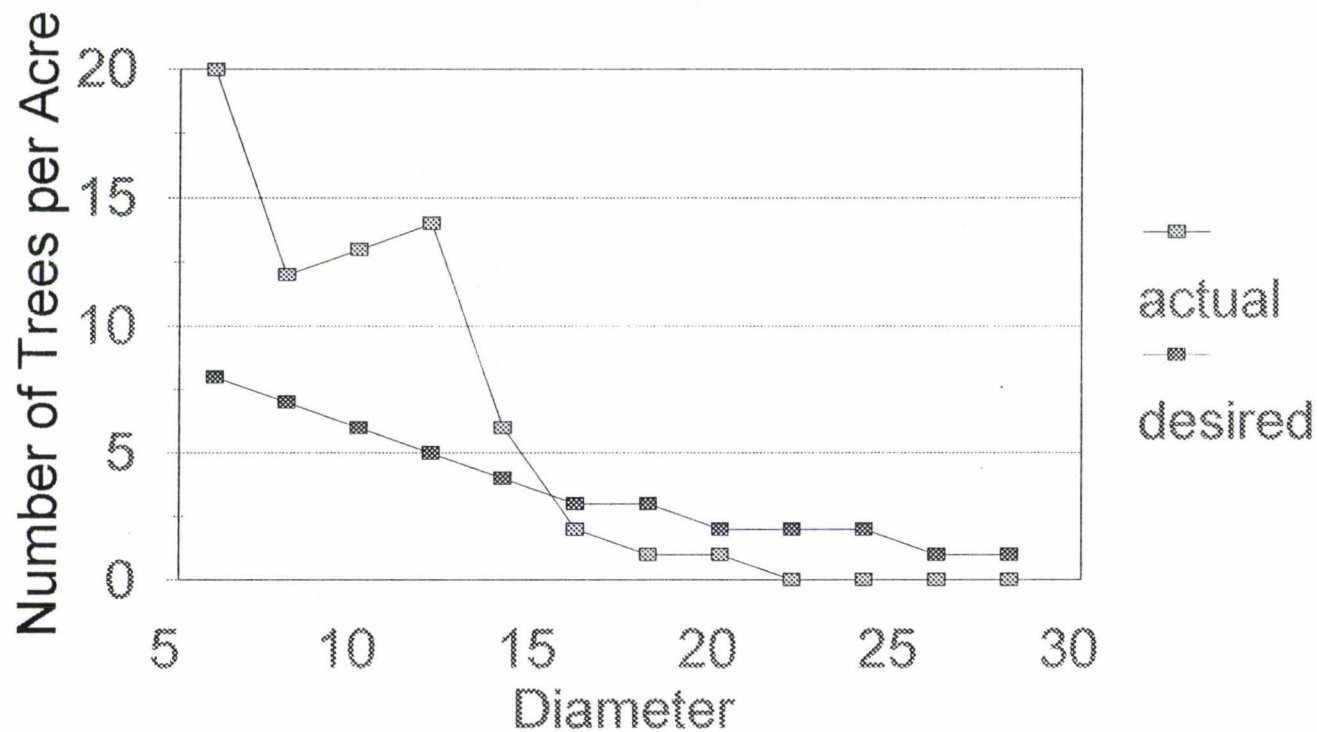
Stand 25



Stand 27

DBH	actual	desired
6	20	8
8	12	7
10	13	6
12	14	5
14	6	4
16	2	3
18	1	3
20	1	2
22	0	2
24	0	2
26	0	1
28	0	1

Horsetooth Mountain Park Stand 27



Horsetooth Mountain Park Timber Stand Evaluation

March 1998

Stand #	Acreage	Notes
1	479.5	Not enough trees to sample
3	72	10 plots sampled. Mostly Ponderosa Pine. No dwarf mistletoe encountered in plots, Regeneration varied 100, 100, 300, 100, 7000. Common Understory: Grasses- Big Blue stem, Cheat grass; Mt. Mahogany, currant, Rocky Mt. Maple. Encountered some Bull Thistle in the lower part of the stand.
5	292.2	<p>29 plots sampled. Mixed Ponderosa Pine and Douglas Fir. Encountered 2 stands of Aspen, one along the upper Wathen Trail along the drainage that it follows. Another stand was found along the old Horsetooth Rock trail. This stand is quite variable. It varies from major granite rock outcroppings with poor site indices and no trees to rich north and east facing slopes with high site indices. Dwarf Mistletoe is prevalent in the upper portions of the stand and the lower areas around upper Spring Creek (ratings as high as 7 in some sample trees). We noted one small pocket (less than 1 acre) of beetle infestation along the Wathen trail near the intersection of the Horsetooth Rock trail. We also found a sizable pile of slab wood from a former saw mill site, which could pose a fire hazard, along the Wathen Trail approximately ¼ mile east of the intersection with the Horsetooth Rock Trail. We found a patch of Canadian Thistle in one plot along the Wathen Trail by the spring tank. Approximately 20 acres of this stand are located on the south and west side of Horsetooth Rock, some of this area was burned over during the early 1980's.</p> <p>Understory varied from grasses mixed with Mule's Ear Mullein, Mountain Mahogany, and Currant on the south facing slopes to Mountain Ninebark, Ground Juniper, Rocky Mountain Maple, and Cherry on the richer north facing slopes and bottoms. Regeneration was found in 11 plots: 200, 400, 700, 800, 300, 700, 100, 1400, 300, 100, 900.</p>

Stand #	Acreage	Notes
7	21.5	10 plots. This stand is located on the west side of Horsetooth Rock. It is characterized as VERY STEEP and ROCKY!! Slopes as great as 70°. It contains a mix of Ponderosa Pine and Douglas Fir. The upper slopes on the south side of the stand are somewhat open with a mix of Ponderosa Pine, Mountain Mahogany, and grasses (Big Blue Stem and Little Blue Stem). The north side of the stand is located primarily on a west facing slope along a drainage and is comprised of Douglas Fir and shrubs (Currant, Salmon Berry, Mountain Ninebark, and Ground Juniper). Some Dwarf Mistletoe was found outside of the sample plots along the western edge of the stand (DMR < 5). Regeneration was found in 2 plots (100, 200).
9	56.2.	10 plots. This stand is fairly thick, mostly Ponderosa Pine with some Douglas Fir on the north facing slopes. This stand is located below a large saddle north of Horsetooth Rock, we saw numerous birds passing through the area. Understory is comprised of grasses, Ground Juniper, and Currant. Dwarf Mistletoe was found in 2 plots but was prevalent in the stand. Beetle infestation was found in one plot just above Spring Creek (small area, only 3-4 trees). We found regeneration in most plots (100, 300, 100, 100, 1000, 400, 3300, 6900).
11	149.7	15 plots. Stand is located along upper Spring Creek, evenly mixed Ponderosa Pine and Douglas Fir. We found one stand of Aspen along the bottom of Spring Creek. This stand contains the "Big Tree". This is a 48" X 80' Douglas Fir and is approximately 325 years old. We did encounter a large pocket of beetle infestation (apx. 1 acre). This needs immediate attention in order to control the spread. The pocket is located approximately 200 feet @ 230° from the "Big Tree". We encountered considerable pockets of Dwarf Mistletoe throughout the stand. We sampled at least 1 tree in 6 of the 15 plots sampled. Regeneration was found in 8 of the plots (100, 2100, 1600, 100, 1000, 100, 2100, 100).

Stand #	Acreage	Notes
7	21.5	10 plots. This stand is located on the west side of Horsetooth Rock. It is characterized as VERY STEEP and ROCKY!! Slopes as great as 70°. It contains a mix of Ponderosa Pine and Douglas Fir. The upper slopes on the south side of the stand are somewhat open with a mix of Ponderosa Pine, Mountain Mahogany, and grasses (Big Blue Stem and Little Blue Stem). The north side of the stand is located primarily on a west facing slope along a drainage and is comprised of Douglas Fir and shrubs (Currant, Salmon Berry, Mountain Ninebark, and Ground Juniper). Some Dwarf Mistletoe was found outside of the sample plots along the western edge of the stand (DMR < 5). Regeneration was found in 2 plots (100, 200).
9	56.2.	10 plots. This stand is fairly thick, mostly Ponderosa Pine with some Douglas Fir on the north facing slopes. This stand is located below a large saddle north of Horsetooth Rock, we saw numerous birds passing through the area. Understory is comprised of grasses, Ground Juniper, and Currant. Dwarf Mistletoe was found in 2 plots but was prevalent in the stand. Beetle infestation was found in one plot just above Spring Creek (small area, only 3-4 trees). We found regeneration in most plots (100, 300, 100, 100, 1000, 400, 3300, 6900).
11	149.7	15 plots. Stand is located along upper Spring Creek, evenly mixed Ponderosa Pine and Douglas Fir. We found one stand of Aspen along the bottom of Spring Creek. This stand contains the "Big Tree". This is a 48" X 80' Douglas Fir and is approximately 325 years old. We did encounter a large pocket of beetle infestation (apx. 1 acre). This needs immediate attention in order to control the spread. The pocket is located approximately 200 feet @ 230° from the "Big Tree". We encountered considerable pockets of Dwarf Mistletoe throughout the stand. We sampled at least 1 tree in 6 of the 15 plots sampled. Regeneration was found in 8 of the plots (100, 2100, 1600, 100, 1000, 100, 2100, 100).

Stand #	Acreage	Notes
13	7.5	10 plots. This was a unique stand of trees that is located on the west side of the park and north of the towers site. The stand is intersected by the towers service road. This is a fairly open stand with mostly Ponderosa Pine and few Douglas Fir along the drainage on the south side of the stand. The stand is situated along a south and east aspect with slopes under 20°. Understory is composed of grasses and forbs, with some Currant, Ground Juniper and Salmon Berry. I encountered 1 scraggly Lodgepole Pine along the ridge on the north side of the stand, this was the only Lodgepole Pine I found in the park. Regeneration was found in 3 plots (100, 300, 100).
15	166.6	16 plots. This stand is located on the south side of Mill Canyon. The stand is situated on a North aspect with slopes in excess of 20°. To say the least, the stand is thick, steep, and rocky. The stand has a very high fuel loading with numerous blow downs and stagnated trees. It needs thinning or prescribed burning to reduce the potential of an intense natural fire. The stand primarily consists Douglas Fir and occasional Ponderosa Pine. Understory is composed of Ground Juniper, Currant, Mt. Ninebark, Rocky Mt. Maple, Cherry, along with some grasses, and an occasional Willow and Water Birch in the creek bottom. Regeneration was encountered in most plots (1100, 500, 1400, 2300, 300, 100, 100, 600, 100, 600, 400, 800, 100, 5400, 2100).
17	44	10 plots. This stand is located on the north side of Mill Canyon and runs along the north boundary with Lory State Park. The stand is fairly steep but open. Aspect is primarily south with slopes of 20- 30°. It is characterized as open Ponderosa Pine with an understory of grasses, Mt. Mahogany and Ground Juniper. We found some Canada Thistle in 1 plot. Regeneration was found in 3 plots (200, 200, 100).
19	134.5	13 plots. This stand runs from upper Spring Creek east to the lower meadow along the reservoir. The stand is fairly steep but open. Aspect is primarily east with slopes of 20- 30°. It is comprised of Ponderosa Pine with occasional Douglas Fir in the understory. Understory is primarily grasses, Mt. Mahogany, and Currant. We found a number of pockets of very healthy Ponderosa Pines with excellent form. Very little Dwarf Mistletoe was encountered. Regeneration was found in 7 plots (2400, 100, 4900, 100, 500, 400, 500).

Stand #	Acreage	Notes
21	98.5	10 plots. This stand runs from the Towers Service Road east to the open meadow along the reservoir. It has an east aspect with slopes of 10- 30°. The stand consists primarily of Ponderosa Pine with small scattered openings. Understory consists of grasses, Mullein, Mt. Mahogany, and Currant. We found Dwarf Mistletoe in one plot. Regeneration was found in 5 plots (300, 100, 100, 6600, 1200)
23	239	24 Plots. This stand is bordered on the west by Spring Creek and runs to the east where it is bordered by the east boundary, it includes some of the ridge line on the east side of Spring Creek. Aspect is variable and slope varied from 12° to 30°. The stand consists of Ponderosa Pine with occasional Douglas Fir on the north facing slopes. Understory was grasses, Mt. Mahogany, Ground Juniper, and Currant. We encountered Dwarf Mistletoe in 7 plots and found some old "beetle kill" trees. We also found a pocket of current beetle infestation (apx. 2 ac.) along the Herrington Trail, near the top of the ridge line. Regeneration was found in 14 plots (100, 100, 200, 100, 600, 4800, 200, 100, 600, 100, 300, 400, 300, 100)
25	303	30 plots. This is a fairly open stand with scattered pockets of Ponderosa Pine. Aspect is variable and slopes vary from 16° to 44°. Understory is primarily grasses with patches of Mt. Mahogany and some Skunk Brush. We found no Dwarf Mistletoe or beetle infestation in this stand. Regeneration was not found in any of the plots. We saw a large herd of deer (40 -50) along an east facing slope in this stand. We also found a number of shed antlers in the stand, which would indicate that the deer use this area on a regular basis throughout the Winter months.
27	39.8	10 plots. This stand is located along the towers service road and is surrounded by stand 25. It is primarily north facing with slopes of 8° to 40°. The stand is fairly evenly mixed with Ponderosa Pine and Douglas Fir. Understory is primarily Mt. Mahogany, Ground Juniper, and grasses. Dwarf Mistletoe was encountered in 1 plot but was seen throughout the stand. Regeneration was found in 3 plots (100, 200, 300).

Appendix 4

Best Management Practices

Appendix 5

Timber Sale Contract Example

Appendix 6

Cruise Data and Reports

Stand 3

PLOT TREE SPECIES DBH HEIGHT AGE

03 05 4 05.1 020 000
03 06 4 10.0 040 000
03 07 4 06.5 025 000
03 08 4 23.1 056 097
04 01 4 06.1 010 000
04 02 4 09.1 030 000
04 03 4 10.1 032 000
04 04 4 06.0 026 000
04 05 4 13.3 032 000
06 01 4 11.4 035 000
06 02 4 13.2 040 081
06 03 4 09.3 010 000
07 01 4 04.1 007 000
07 02 4 11.0 015 000
07 03 4 13.6 035 000
07 04 4 14.2 043 000
07 05 4 12.0 025 000
10 01 4 20.1 042 000
10 02 4 11.2 027 000
10 03 4 12.2 035 000
10 04 4 08.5 020 000
11 01 4 12.1 035 000
11 02 4 11.4 042 000
11 03 4 17.0 040 000
11 04 4 20.6 030 000
11 05 4 12.5 031 000
11 06 4 16.8 042 000

Stand 5

PLOT TREE SPECIES DBH HEIGHT AGE

01 01 4 18.0 036 000
03 01 4 23.0 052 000
03 02 4 31.0 033 160
04 01 4 19.0 048 000
04 02 1 06.0 015 000
06 01 4 14.0 034 000
06 02 4 07.0 028 000
06 03 4 11.0 030 000
06 04 4 06.0 022 000
06 05 4 12.0 038 060
06 06 4 10.0 033 000
06 07 4 09.0 036 000
07 01 4 12.0 030 000
07 02 4 09.0 032 000
07 03 4 14.0 028 000
09 01 1 14.0 054 107
09 02 1 10.0 045 000
09 03 1 18.0 060 000
10 01 4 10.0 040 000
10 02 4 11.0 044 000
10 03 4 09.0 030 000
10 04 4 10.0 044 000
10 05 4 04.0 013 000
10 06 4 07.0 020 000
10 07 4 09.0 035 000
10 08 4 11.0 045 000
10 09 4 08.0 036 000
10 10 1 16.0 050 000
11 01 4 16.0 034 000
12 01 4 21.0 041 000
12 02 4 15.0 042 148
12 03 4 12.0 028 000
13 01 1 14.0 038 000
13 02 1 14.0 050 000
13 03 1 13.0 024 000
13 04 1 11.0 037 000
13 05 4 17.0 042 000
13 06 1 19.0 040 000
13 07 1 16.0 042 000
14 01 4 15.0 036 000
14 02 4 15.0 040 000
15 01 4 06.0 023 000
15 02 4 15.0 051 000
15 03 4 06.0 014 000
15 04 4 11.0 044 070

15 05 4 13.0 048 000
15 06 4 10.0 048 000
15 07 4 06.0 044 000
15 08 4 09.0 042 000
15 09 4 09.0 040 000
17 01 4 07.0 023 000
18 01 4 12.0 032 128
18 02 4 11.0 030 000
19 01 4 11.0 040 000
21 01 4 11.0 045 000
21 02 4 16.0 057 170
21 03 4 19.0 050 000
21 04 4 14.0 040 000
21 05 4 18.0 042 000
21 06 4 18.0 060 000
21 07 4 16.0 045 000
22 01 4 10.0 022 000
22 02 4 17.0 046 000
22 03 4 18.0 052 000
23 01 4 08.5 012 000
24 01 4 14.0 046 000
24 02 4 12.0 038 000
27 01 4 15.0 042 110
29 01 4 23.0 073 000
29 02 4 18.0 025 000

Stand 7

PLOT TREE SPECIES DBH HEIGHT AGE

01 01 4 18.0 038 000
02 01 4 09.0 017 000
02 02 4 09.0 021 000
02 03 4 07.0 018 000
02 04 4 06.0 016 000
02 05 4 18.0 038 000
02 06 4 10.0 032 000
03 01 4 18.0 032 089
04 01 4 17.0 030 000
04 02 4 13.0 018 000
04 03 4 16.0 032 000
04 04 4 16.5 040 000
05 01 1 16.0 038 000
05 02 4 10.0 030 000
05 03 1 12.5 032 000
06 01 4 20.5 060 000
06 02 1 16.5 048 123
06 03 1 16.0 050 000
06 04 1 09.0 028 000
06 05 4 14.0 034 000
06 06 4 14.5 035 000
06 07 1 23.0 040 000
07 01 4 16.0 030 000
08 01 1 09.0 026 000
08 02 1 12.5 035 000
08 03 1 13.0 032 000
09 01 4 14.0 032 000
09 02 4 11.0 024 000
09 03 4 15.5 034 110
10 01 1 18.0 060 000

Stand 9

PLOT TREE SPECIES DBH HEIGHT AGE

01	01	1	10.0	021	000
01	02	4	05.0	010	000
01	03	4	06.5	010	000
01	04	4	03.0	010	000
01	05	4	03.0	006	000
02	01	1	05.5	026	000
02	02	1	08.0	024	000
03	01	4	12.5	046	072
04	01	1	23.0	062	000
05	01	4	12.0	032	000
05	02	4	15.0	040	000
05	03	4	16.5	037	000
07	01	1	14.0	035	000
07	02	4	08.0	016	000
07	03	1	11.0	038	000
08	01	1	17.0	046	000
08	02	1	11.0	028	000
08	03	1	15.0	045	000
09	01	1	12.0	030	000

Stand 11

PLOT TREE SPECIES DBH HEIGHT AGE

01 01 4 08.6 030 000
01 02 4 18.3 038 000
01 03 4 13.8 044 000
02 01 1 12.6 060 000
03 01 4 12.8 054 095
03 02 4 11.6 048 000
03 03 4 11.7 050 000
04 01 4 10.8 028 000
04 02 4 11.6 030 000
04 03 4 13.6 046 000
04 04 4 07.7 038 000
04 05 4 09.0 031 000
04 06 1 09.2 020 000
05 01 1 10.9 051 000
05 02 1 11.6 055 000
05 03 1 09.5 058 000
05 04 1 13.1 056 000
05 05 4 11.4 060 000
05 06 1 08.5 054 000
05 07 1 09.5 057 000
05 08 1 15.9 064 000
05 09 4 05.4 021 000
05 10 1 17.4 073 000
06 01 4 18.8 045 000
06 02 4 09.7 034 000
06 03 4 09.9 021 000
06 04 4 13.5 046 104
06 05 4 09.7 042 000
07 01 4 22.5 052 000
09 01 4 18.0 060 000
09 02 4 22.0 060 000
09 03 4 17.0 055 000
09 04 4 12.0 055 000
09 05 4 15.0 060 135
09 06 4 22.0 050 000
09 07 4 22.5 050 000
09 08 4 08.0 035 000
11 01 4 10.0 040 000
11 02 1 17.0 048 000
11 03 4 13.5 055 000
11 04 1 06.0 022 000
11 05 4 12.0 050 000
11 06 4 14.0 040 000
11 07 1 20.5 060 000
11 08 1 14.0 050 000

11 09 1 20.0 055 000
11 10 1 09.0 020 000
12 01 4 16.5 035 000
12 02 4 08.0 022 000
12 03 4 10.0 033 000
12 04 4 14.0 036 000
13 01 1 15.0 052 103
13 02 1 12.5 045 000
13 03 4 03.0 012 000
13 04 1 06.0 030 000
13 05 4 04.0 016 000
13 06 1 11.0 042 000
14 01 4 06.0 018 000
15 01 4 08.0 036 000
15 02 4 05.5 022 000
15 03 4 07.5 036 000
15 04 4 07.5 038 070
15 05 4 09.5 032 000
15 06 4 11.0 044 000
15 07 4 09.0 040 000

Stand 13

PLOT TREE SPECIES DBH HEIGHT AGE

02 01 4 11.0 021 000

06 01 4 18.5 035 037

06 02 4 04.5 013 000

06 03 4 10.5 023 000

08 01 4 09.5 018 000

Stand 15

PLOT TREE SPECIES DBH HEIGHT AGE

01 01 4 10.0 020 000
01 02 4 11.0 024 000
01 03 4 14.0 035 000
01 04 4 07.0 018 000
01 05 4 09.0 034 000
01 06 4 08.0 030 000
01 07 4 05.0 022 000
01 08 4 04.5 020 000
01 09 4 04.5 018 000
02 01 1 07.5 046 000
02 02 1 05.5 028 000
02 03 1 25.0 087 000
02 04 1 04.5 028 000
02 05 1 07.0 038 000
02 06 1 04.0 020 000
02 07 4 16.0 070 000
02 08 1 22.5 083 000
02 09 4 09.0 060 000
02 10 4 15.0 062 000
03 01 1 15.5 047 090
03 02 1 07.0 024 000
04 01 1 15.0 060 000
04 02 4 07.0 040 000
04 03 1 12.0 055 000
04 04 4 08.5 043 000
04 05 4 19.5 052 000
05 01 4 05.5 015 000
05 02 4 14.0 039 000
06 01 1 05.0 016 000
06 02 1 03.0 020 000
06 03 1 06.5 021 000
06 04 4 15.0 044 000
06 05 4 10.5 040 117
06 06 1 06.5 030 000
06 07 1 05.0 028 000
07 01 4 14.5 050 000
07 02 4 09.0 038 000
07 03 4 12.5 048 000
07 04 1 24.5 044 000
07 05 4 12.0 044 000
07 06 4 11.5 046 000
08 01 4 19.0 044 000
09 01 4 22.0 070 000
09 02 4 22.0 068 000
09 03 4 23.0 070 215

09 04 4 08.5 026 000
10 01 1 26.0 054 000
10 02 1 11.5 048 000
10 03 4 14.0 066 000
10 04 4 06.0 030 000
10 05 1 14.0 063 000
11 01 1 06.5 032 000
11 02 1 17.5 061 000
12 01 4 14.5 042 177
12 02 4 10.0 030 000
13 01 4 18.0 044 000
13 02 4 16.5 038 000
13 03 4 23.0 035 000
14 01 1 10.5 041 000
14 02 4 12.5 052 000
14 03 4 24.5 060 000
14 04 4 18.5 058 000
14 05 1 11.0 042 000
14 06 1 10.5 036 000
14 07 1 11.0 044 000
15 01 1 14.0 040 159
15 02 1 11.5 038 000
15 03 1 04.5 027 000
15 04 1 11.0 038 000
16 01 1 08.0 041 000
16 02 4 14.5 054 000
16 03 4 13.5 048 000
16 04 4 10.0 038 000
16 05 1 06.5 038 000
16 06 1 08.0 046 000
16 07 1 10.0 045 000

Stand 17

PLOT TREE SPECIES DBH HEIGHT AGE

03	01	4	11.5	044	000
03	02	4	04.0	011	000
03	03	4	09.5	041	000
03	04	4	05.5	023	000
03	05	4	11.0	043	000
03	06	4	13.0	046	000
03	07	4	10.5	044	000
03	08	4	09.5	042	000
03	09	4	11.5	046	074
04	01	4	11.5	038	000
04	02	4	11.5	023	000
04	03	4	16.5	044	000
05	01	4	13.5	036	000
06	01	4	19.5	044	064
06	02	4	04.0	014	000
07	01	4	16.0	062	000
08	01	4	12.0	040	000
08	02	4	12.5	044	000
08	03	4	12.0	051	000
08	04	4	12.5	053	000
09	01	4	13.0	042	077
09	02	4	10.0	040	000
09	03	4	13.0	040	000
09	04	4	14.0	046	000
09	05	4	12.0	038	000
10	01	1	12.0	042	000
10	02	4	21.0	064	000
10	03	4	11.0	018	000

Stand 19

PLOT TREE SPECIES DBH HEIGHT AGE

01 01 4 12.5 045 000
01 02 4 14.5 053 000
03 01 4 11.0 050 000
03 02 4 12.0 054 000
03 03 4 19.5 058 115
03 04 4 14.5 055 000
03 05 4 24.0 060 000
04 01 4 09.0 022 000
04 02 4 13.0 045 000
05 01 4 09.0 030 000
05 02 4 10.0 037 000
05 03 4 09.0 032 000
05 04 4 08.0 026 000
05 05 4 07.0 025 000
06 01 4 11.0 037 000
06 02 4 06.5 013 000
06 03 4 12.0 039 088
07 01 4 20.5 057 000
07 02 4 21.0 057 000
08 01 4 10.0 046 000
08 02 4 08.0 040 000
08 03 4 12.0 054 000
08 04 4 11.5 052 000
08 05 4 04.5 035 000
08 06 4 11.5 047 000
08 07 4 15.0 050 000
08 08 4 15.0 052 000
09 01 4 20.0 072 000
09 02 4 22.5 075 000
09 03 1 06.0 038 000
09 04 4 14.0 080 000
09 05 4 12.0 060 000
09 06 4 14.0 075 000
09 07 1 12.0 055 000
09 08 4 13.0 066 000
09 09 4 14.0 074 075
10 01 4 04.5 028 000
10 02 4 06.5 028 000
10 03 4 08.0 030 000
10 04 4 15.0 041 000
10 05 4 06.5 033 000
10 06 4 10.0 040 000
10 07 4 07.5 037 000
10 08 4 08.0 042 000

10 09 4 17.0 037 000
11 01 4 13.0 044 000
11 02 4 09.0 037 000
11 03 4 08.0 034 000
12 01 4 17.0 035 000
12 02 4 06.5 032 000
12 03 4 16.0 055 000
12 04 4 18.0 071 000
12 05 4 17.5 060 157
13 01 4 16.0 047 000
13 02 4 11.0 032 000
13 03 4 18.5 051 000
13 04 4 09.0 047 000
13 05 4 14.0 049 000

Stand 21

PLOT TREE SPECIES DBH HEIGHT AGE

01 01 4 09.0 037 000
01 02 4 12.0 044 000
02 01 4 16.5 064 089
02 02 4 16.0 060 000
02 03 4 12.5 042 000
02 04 4 10.5 037 000
03 01 4 04.0 012 000
03 02 4 03.5 014 000
03 03 4 07.5 038 000
03 04 4 06.0 032 000
03 05 4 10.5 032 000
03 06 4 14.5 038 000
03 07 4 10.5 038 125
04 01 4 09.0 026 000
04 02 4 08.5 026 000
05 01 4 13.0 057 000
05 02 4 06.5 038 000
05 03 4 05.0 026 000
05 04 4 05.0 022 000
05 05 4 09.0 042 000
05 06 4 08.0 042 000
05 07 4 10.5 050 000
05 08 4 09.0 036 000
05 09 4 06.5 038 000
05 10 4 06.5 040 000
05 11 4 06.0 028 000
05 12 4 06.5 038 000
05 13 4 15.5 058 000
06 01 4 17.5 054 000
06 02 4 14.5 060 000
06 03 4 14.5 050 000
06 04 4 12.0 073 000
06 05 4 03.0 020 000
06 06 4 21.5 076 000
07 01 4 07.0 024 000
07 02 4 24.0 078 000
07 03 1 06.5 036 000

Stand 23

PLOT TREE SPECIES DBH HEIGHT AGE

01 01 4 13.0 027 000
01 02 4 22.0 048 000
01 03 4 03.0 012 000
02 01 1 17.5 054 000
02 02 4 04.0 022 000
02 03 4 09.5 035 000
03 01 4 13.0 037 000
03 02 4 23.0 070 000
03 03 4 21.0 060 140
05 01 4 14.5 035 000
06 01 4 13.0 050 000
06 02 4 19.5 054 170
07 01 4 10.0 032 000
07 02 4 24.0 067 000
09 01 4 09.0 037 000
09 02 4 05.5 023 000
09 03 4 12.5 052 104
09 04 4 09.0 031 000
09 05 4 12.5 043 000
09 06 4 09.5 040 000
09 07 4 05.0 018 000
09 08 4 04.0 014 000
09 09 4 07.5 022 000
10 01 4 14.5 042 000
11 01 4 08.5 026 000
11 02 4 13.0 048 000
11 03 4 10.5 038 000
11 04 4 18.0 050 000
12 01 4 16.0 039 052
12 02 4 13.0 036 000
13 01 4 19.0 053 000
14 01 4 12.5 043 000
14 02 4 09.0 024 000
15 01 4 12.0 041 132
15 02 4 12.5 043 000
16 01 4 07.0 032 000
16 02 4 14.5 044 000
16 03 4 12.5 040 000
16 04 4 08.5 038 000
16 05 1 10.0 044 000
16 06 4 07.5 038 000
16 07 4 09.5 046 000
16 08 1 07.0 028 000
16 09 1 13.0 050 000

17 01 4 12.0 023 000
17 02 4 17.0 038 000
17 03 4 15.5 038 000
17 04 4 15.0 040 000
18 01 4 05.0 026 000
18 02 4 05.5 030 000
18 03 4 08.5 030 000
18 04 4 07.0 026 000
18 05 4 06.5 030 044
18 06 1 06.0 030 000
19 01 4 12.5 036 000
20 01 4 12.0 039 000
21 01 4 11.5 033 000
21 02 4 09.0 032 000
21 03 4 11.0 034 094
21 04 4 06.5 026 000
22 01 4 13.0 040 000
23 01 4 11.0 022 000

Stand 25

PLOT TREE SPECIES DBH HEIGHT AGE

01	01	4	20.0	043	000
01	02	4	06.0	014	000
01	03	4	18.0	038	000
01	04	4	11.5	026	000
01	05	4	06.0	016	000
02	01	4	15.5	030	000
04	01	4	17.0	037	000
06	01	4	18.0	038	097
08	01	4	14.0	037	000
11	01	4	12.0	032	000
13	01	4	19.0	038	000
19	01	4	14.0	030	095
22	01	4	19.5	040	000
22	02	4	21.5	046	000
22	03	4	13.5	032	000
24	01	4	14.0	034	064
26	01	4	16.5	032	000
31	01	4	27.0	060	195

Stand 27

PLOT TREE SPECIES DBH HEIGHT AGE

01 01 4 16.5 043 000
02 01 1 16.0 047 000
02 02 4 10.5 030 000
04 01 4 12.0 028 074
05 01 4 06.0 010 000
05 02 1 12.0 022 000
05 03 4 13.5 034 000
06 01 1 16.5 068 000
06 02 1 11.5 047 000
06 03 1 13.0 055 000
06 04 4 13.0 060 000
06 05 1 14.5 065 102
06 06 4 13.0 058 000
06 07 1 09.5 042 000
06 08 4 19.0 055 000
07 01 4 19.5 048 000
07 02 1 17.0 040 000
08 01 4 04.5 015 000
08 02 4 09.0 035 000
08 03 4 11.0 040 000
08 04 4 07.0 020 000
08 05 4 10.0 030 000
08 06 4 14.0 045 000
08 07 4 08.5 033 000
08 08 4 11.0 040 000
08 09 4 09.5 037 000
08 10 4 08.0 035 000
08 11 4 11.5 042 000
08 12 4 12.0 042 000
08 13 4 10.0 039 000
08 14 4 11.5 042 000
08 15 4 05.0 014 000
08 16 4 11.0 038 000
08 17 4 18.0 045 000
08 18 4 07.5 035 000
09 01 4 10.0 023 040
10 01 4 15.5 028 000
10 02 4 11.0 026 000

STAND: Horsetooth 3

PER ACRE STAND SUMMARY
ALL SPECIES

		HEIGHT CLASS											TOTAL
DBH		20	30	40	50	60	70	80	90	100	110	120	
STEMS	6	28	7	0	0	0	0	0	0	0	0	0	35
CVOL	6	31	14	0	0	0	0	0	0	0	0	0	45
SCRIB	6	0	0	0	0	0	0	0	0	0	0	0	0
STEMS	8	4	0	0	0	0	0	0	0	0	0	0	4
CVOL	8	11	0	0	0	0	0	0	0	0	0	0	11
SCRIB	8	34	0	0	0	0	0	0	0	0	0	0	34
STEMS	10	4	7	3	0	0	0	0	0	0	0	0	13
CVOL	10	12	38	25	0	0	0	0	0	0	0	0	75
SCRIB	10	28	68	65	0	0	0	0	0	0	0	0	162
STEMS	12	5	11	2	0	0	0	0	0	0	0	0	18
CVOL	12	28	103	27	0	0	0	0	0	0	0	0	157
SCRIB	12	56	305	90	0	0	0	0	0	0	0	0	451
STEMS	14	0	3	3	0	0	0	0	0	0	0	0	7
CVOL	14	0	43	53	0	0	0	0	0	0	0	0	96
SCRIB	14	0	152	211	0	0	0	0	0	0	0	0	363
STEMS	16	0	0	1	0	0	0	0	0	0	0	0	1
CVOL	16	0	0	27	0	0	0	0	0	0	0	0	27
SCRIB	16	0	0	121	0	0	0	0	0	0	0	0	121
STEMS	18	0	0	1	0	0	0	0	0	0	0	0	1
CVOL	18	0	0	26	0	0	0	0	0	0	0	0	26
SCRIB	18	0	0	114	0	0	0	0	0	0	0	0	114
STEMS	20	0	1	1	0	0	0	0	0	0	0	0	1
CVOL	20	0	19	27	0	0	0	0	0	0	0	0	47
SCRIB	20	0	88	129	0	0	0	0	0	0	0	0	217
STEMS	24	0	0	0	0	1	0	0	0	0	0	0	1
CVOL	24	0	0	0	0	37	0	0	0	0	0	0	37
SCRIB	24	0	0	0	0	183	0	0	0	0	0	0	183

TOTAL													
STEMS	0	40	29	12	0	1	0	0	0	0	0	0	81
CVOL	0	81	217	186	0	37	0	0	0	0	0	0	520
SCRIB	0	118	614	731	0	183	0	0	0	0	0	0	1645

STAND: Horsetooth 3

PER ACRE SUMMARY

STEMS	BA	DBH	HT	AGE
81	43	9.9	32	87

CRUISE SUMMARY

BAF USED= 10 POINTS SAMPLED= 6 AVG. # TREES/PT.= 4.3

STAND: Horsetooth 5

PER ACRE STAND SUMMARY
ALL SPECIES

		HEIGHT CLASS											TOTAL
DBH		20	30	40	50	60	70	80	90	100	110	120	
STEMS	6	10	0	2	0	0	0	0	0	0	0	0	11
CUVOL	6	10	0	5	0	0	0	0	0	0	0	0	1
SCRIB	6	-13	0	0	0	0	0	0	0	0	0	0	-1
STEMS	8	3	1	1	0	0	0	0	0	0	0	0	6
CUVOL	8	7	3	4	0	0	0	0	0	0	0	0	1
SCRIB	8	28	10	8	0	0	0	0	0	0	0	0	46
STEMS	10	1	3	4	1	0	0	0	0	0	0	0	1
CUVOL	10	3	16	32	6	0	0	0	0	0	0	0	5
SCRIB	10	5	27	80	19	0	0	0	0	0	0	0	132
STEMS	12	0	2	4	0	0	0	0	0	0	0	0	1
CUVOL	12	0	19	44	0	0	0	0	0	0	0	0	63
SCRIB	12	0	51	146	0	0	0	0	0	0	0	0	197
STEMS	14	0	1	1	1	0	0	0	0	0	0	0	3
CUVOL	14	3	8	11	27	0	0	0	0	0	0	0	49
SCRIB	14	11	29	43	114	0	0	0	0	0	0	0	19
STEMS	16	0	0	2	1	0	0	0	0	0	0	0	3
CUVOL	16	0	5	33	14	8	0	0	0	0	0	0	6
SCRIB	16	0	19	141	61	35	0	0	0	0	0	0	25
STEMS	18	0	0	0	0	0	0	0	0	0	0	0	1
CUVOL	18	3	0	11	13	17	0	0	0	0	0	0	4
SCRIB	18	13	0	51	61	79	0	0	0	0	0	0	204
STEMS	20	0	0	0	0	0	0	0	0	0	0	0	1
CUVOL	20	0	0	6	13	0	0	0	0	0	0	0	1
SCRIB	20	0	0	26	63	0	0	0	0	0	0	0	88
STEMS	22	0	0	0	0	0	0	0	0	0	0	0	1
CUVOL	22	0	0	6	0	0	0	0	0	0	0	0	6
SCRIB	22	0	0	26	0	0	0	0	0	0	0	0	26
STEMS	24	0	0	0	0	0	0	0	0	0	0	0	0
CUVOL	24	0	0	0	7	0	10	0	0	0	0	0	17
SCRIB	24	0	0	0	35	0	50	0	0	0	0	0	8
STEMS	32	0	0	0	0	0	0	0	0	0	0	0	0
CUVOL	32	0	4	0	0	0	0	0	0	0	0	0	4
SCRIB	32	0	22	0	0	0	0	0	0	0	0	0	2

TOTAL													
STEMS	0	14	8	14	3	1	0	0	0	0	0	0	4
CUVOL	0	26	56	152	81	24	10	0	0	0	0	0	34
SCRIB	0	44	159	519	353	114	50	0	0	0	0	0	1239

STAND: Horsetooth 5

PER ACRE SUMMARY

ITEMS	BA	DBH	HT	AGE
40	24	10.5	39	119

CRUISE SUMMARY

BAF USED= 10 POINTS SAMPLED= 29 AVG. # TREES/PT.= 2.4

STAND: Horsetooth 7

PER ACRE STAND SUMMARY
ALL SPECIES

		HEIGHT CLASS											TOTAL
DBH		20	30	40	50	60	70	80	90	100	110	120	
STEMS	6	5	0	0	0	0	0	0	0	0	0	0	5
CUVOL	6	6	0	0	0	0	0	0	0	0	0	0	6
SCRIB	6	0	0	0	0	0	0	0	0	0	0	0	0
STEMS	8	4	0	0	0	0	0	0	0	0	0	0	4
CUVOL	8	6	0	0	0	0	0	0	0	0	0	0	6
SCRIB	8	30	0	0	0	0	0	0	0	0	0	0	30
STEMS	10	5	8	0	0	0	0	0	0	0	0	0	13
CUVOL	10	14	42	0	0	0	0	0	0	0	0	0	56
SCRIB	10	36	81	0	0	0	0	0	0	0	0	0	117
STEMS	12	2	2	0	0	0	0	0	0	0	0	0	4
CUVOL	12	9	27	0	0	0	0	0	0	0	0	0	35
SCRIB	12	13	99	0	0	0	0	0	0	0	0	0	112
STEMS	14	1	4	0	0	0	0	0	0	0	0	0	5
CUVOL	14	7	51	0	0	0	0	0	0	0	0	0	59
SCRIB	14	16	193	0	0	0	0	0	0	0	0	0	209
STEMS	16	0	2	1	1	0	0	0	0	0	0	0	5
CUVOL	16	0	37	31	41	0	0	0	0	0	0	0	109
SCRIB	16	0	148	133	177	0	0	0	0	0	0	0	459
STEMS	18	0	1	1	0	1	0	0	0	0	0	0	2
CUVOL	18	0	24	15	0	25	0	0	0	0	0	0	64
SCRIB	18	0	101	66	0	116	0	0	0	0	0	0	284
STEMS	20	0	0	0	0	0	0	0	0	0	0	0	0
CUVOL	20	0	0	0	0	24	0	0	0	0	0	0	24
SCRIB	20	0	0	0	0	116	0	0	0	0	0	0	116
STEMS	24	0	0	0	0	0	0	0	0	0	0	0	0
CUVOL	24	0	0	17	0	0	0	0	0	0	0	0	17
SCRIB	24	0	0	78	0	0	0	0	0	0	0	0	78

TOTAL													
STEMS	0	16	18	2	1	1	0	0	0	0	0	0	38
CUVOL	0	42	181	63	41	49	0	0	0	0	0	0	379
SCRIB	0	95	623	278	177	232	0	0	0	0	0	0	1409

STAND: Horsetooth 7

PER ACRE SUMMARY

STEMS	BA	DBH	HT	AGE
38	29	11.8	34	107

CRUISE SUMMARY

BAF USED= 10

POINTS SAMPLED= 10

AVG. # TREES/PT.= 2.9

STAND: Horsetooth 9

PER ACRE STAND SUMMARY
ALL SPECIES

		HEIGHT CLASS											TOTAL
DBH		20	30	40	50	60	70	80	90	100	110	120	
STEMS	6	33	8	0	0	0	0	0	0	0	0	0	41
CUVOL	6	25	8	0	0	0	0	0	0	0	0	0	32
SCRIB	6	0	0	0	0	0	0	0	0	0	0	0	0
STEMS	8	7	0	0	0	0	0	0	0	0	0	0	7
CUVOL	8	18	0	0	0	0	0	0	0	0	0	0	18
SCRIB	8	35	0	0	0	0	0	0	0	0	0	0	35
STEMS	12	0	5	2	1	0	0	0	0	0	0	0	8
CUVOL	12	0	43	19	22	0	0	0	0	0	0	0	84
SCRIB	12	0	138	67	85	0	0	0	0	0	0	0	290
STEMS	14	0	1	0	0	0	0	0	0	0	0	0	1
CUVOL	14	0	18	0	0	0	0	0	0	0	0	0	18
SCRIB	14	0	70	0	0	0	0	0	0	0	0	0	70
STEMS	16	0	0	3	0	0	0	0	0	0	0	0	3
CUVOL	16	0	0	60	0	0	0	0	0	0	0	0	60
SCRIB	16	0	0	255	0	0	0	0	0	0	0	0	255
STEMS	18	0	0	0	1	0	0	0	0	0	0	0	1
CUVOL	18	0	0	0	24	0	0	0	0	0	0	0	24
SCRIB	18	0	0	0	105	0	0	0	0	0	0	0	105
STEMS	24	0	0	0	0	0	0	0	0	0	0	0	0
CUVOL	24	0	0	0	0	32	0	0	0	0	0	0	32
SCRIB	24	0	0	0	0	159	0	0	0	0	0	0	159

TOTAL													
STEMS	0	40	14	5	2	0	0	0	0	0	0	0	61
CUVOL	0	43	68	79	46	32	0	0	0	0	0	0	268
SCRIB	0	35	209	322	190	159	0	0	0	0	0	0	913

STAND: Horsetooth 9

PER ACRE SUMMARY

STEMS	BA	DBH	HT	AGE
61	23	8.2	33	72

CRUISE SUMMARY

BAF USED= 10 POINTS SAMPLED= 8 AVG. # TREES/PT.= 2.3

STAND: Horsetooth 11

PER ACRE STAND SUMMARY
ALL SPECIES

		HEIGHT CLASS											TOTAL
DBH		20	30	40	50	60	70	80	90	100	110	120	
STEMS	6	25	3	0	0	0	0	0	0	0	0	0	28
CUVOL	6	21	6	0	0	0	0	0	0	0	0	0	27
SCRIB	6	-22	-11	0	0	0	0	0	0	0	0	0	-33
STEMS	8	2	2	8	2	0	0	0	0	0	0	0	14
CUVOL	8	5	8	35	14	0	0	0	0	0	0	0	63
SCRIB	8	15	15	67	47	0	0	0	0	0	0	0	144
STEMS	10	4	6	4	1	3	0	0	0	0	0	0	18
CUVOL	10	14	39	30	14	30	0	0	0	0	0	0	127
SCRIB	10	19	70	72	53	113	0	0	0	0	0	0	327
STEMS	12	0	1	3	5	2	0	0	0	0	0	0	11
CUVOL	12	0	8	34	81	32	0	0	0	0	0	0	154
SCRIB	12	0	20	127	317	130	0	0	0	0	0	0	593
STEMS	14	0	0	2	3	1	0	0	0	0	0	0	5
CUVOL	14	0	0	31	52	15	0	0	0	0	0	0	98
SCRIB	14	0	0	122	215	64	0	0	0	0	0	0	401
STEMS	16	0	0	0	1	1	0	0	0	0	0	0	2
CUVOL	16	0	9	0	14	33	0	0	0	0	0	0	57
SCRIB	16	0	38	0	61	151	0	0	0	0	0	0	251
STEMS	18	0	0	1	1	0	0	0	0	0	0	0	2
CUVOL	18	0	0	22	28	16	20	0	0	0	0	0	86
SCRIB	18	0	0	99	126	75	96	0	0	0	0	0	396
STEMS	20	0	0	0	0	0	0	0	0	0	0	0	0
CUVOL	20	0	0	0	15	17	0	0	0	0	0	0	32
SCRIB	20	0	0	0	72	80	0	0	0	0	0	0	152
STEMS	22	0	0	0	1	0	0	0	0	0	0	0	1
CUVOL	22	0	0	0	40	16	0	0	0	0	0	0	56
SCRIB	22	0	0	0	195	78	0	0	0	0	0	0	273

TOTAL													
STEMS	0	31	13	18	13	7	0	0	0	0	0	0	82
CUVOL	0	40	69	153	257	159	20	0	0	0	0	0	698
SCRIB	0	12	132	487	1086	692	96	0	0	0	0	0	2505

STAND: Horsetooth 11

PER ACRE SUMMARY

STEMS	BA	DBH	HT	AGE
82	43	9.8	43	101

CRUISE SUMMARY

BAF USED= 10

POINTS SAMPLED= 15

AVG. # TREES/PT. = 4.3

STAND: Horsetooth 13

PER ACRE STAND SUMMARY
ALL SPECIES

		HEIGHT CLASS											TOTAL
DBH		20	30	40	50	60	70	80	90	100	110	120	
STEMS	6	9	0	0	0	0	0	0	0	0	0	0	9
CVOL	6	6	0	0	0	0	0	0	0	0	0	0	6
SCRIB	6	0	0	0	0	0	0	0	0	0	0	0	0
STEMS	10	5	0	0	0	0	0	0	0	0	0	0	5
CVOL	10	19	0	0	0	0	0	0	0	0	0	0	19
SCRIB	10	37	0	0	0	0	0	0	0	0	0	0	37
STEMS	18	0	1	0	0	0	0	0	0	0	0	0	1
CVOL	18	0	17	0	0	0	0	0	0	0	0	0	17
SCRIB	18	0	76	0	0	0	0	0	0	0	0	0	76

TOTAL													
STEMS	0	14	1	0	0	0	0	0	0	0	0	0	14
CVOL	0	25	17	0	0	0	0	0	0	0	0	0	42
SCRIB	0	37	76	0	0	0	0	0	0	0	0	0	113

STAND: Horsetooth 13

PER ACRE SUMMARY

STEMS	BA	DBH	HT	AGE
14	5	8.0	25	37

CRUISE SUMMARY

BAF USED= 10 POINTS SAMPLED= 8 AVG. # TREES/PT.= 0.5

STAND: Horsetooth 15

PER ACRE STAND SUMMARY
ALL SPECIES

		HEIGHT CLASS											TOTAL
DBH		20	30	40	50	60	70	80	90	100	110	120	
STEMS	6	29	26	3	0	0	0	0	0	0	0	0	58
CUVOL	6	19	33	8	0	0	0	0	0	0	0	0	60
SCRIB	6	-15	-4	7	0	0	0	0	0	0	0	0	-12
STEMS	8	5	3	8	4	0	0	0	0	0	0	0	20
CUVOL	8	8	12	36	21	0	0	0	0	0	0	0	78
SCRIB	8	13	27	73	58	0	0	0	0	0	0	0	171
STEMS	10	0	3	7	0	1	0	0	0	0	0	0	11
CUVOL	10	0	15	57	0	14	0	0	0	0	0	0	86
SCRIB	10	0	23	169	0	44	0	0	0	0	0	0	236
STEMS	12	1	0	5	4	0	0	0	0	0	0	0	9
CUVOL	12	6	0	51	61	0	0	0	0	0	0	0	117
SCRIB	12	8	0	186	239	0	0	0	0	0	0	0	434
STEMS	14	0	1	2	2	1	1	0	0	0	0	0	5
CUVOL	14	0	8	30	37	16	16	0	0	0	0	0	107
SCRIB	14	0	32	120	158	70	73	0	0	0	0	0	453
STEMS	16	0	0	1	0	1	0	0	0	0	0	0	3
CUVOL	16	0	0	20	12	31	17	0	0	0	0	0	80
SCRIB	16	0	0	85	52	138	81	0	0	0	0	0	356
STEMS	18	0	0	0	0	1	0	0	0	0	0	0	1
CUVOL	18	0	0	11	0	30	0	0	0	0	0	0	41
SCRIB	18	0	0	49	0	142	0	0	0	0	0	0	191
STEMS	20	0	0	0	0	0	0	0	0	0	0	0	1
CUVOL	20	0	0	11	13	0	0	0	0	0	0	0	23
SCRIB	20	0	0	50	61	0	0	0	0	0	0	0	111
STEMS	22	0	0	0	0	0	0	0	0	0	0	0	1
CUVOL	22	0	0	0	0	0	34	20	0	0	0	0	54
SCRIB	22	0	0	0	0	0	170	108	0	0	0	0	278
STEMS	24	0	0	0	0	0	0	0	0	0	0	0	1
CUVOL	24	0	9	12	0	15	17	0	0	0	0	0	52
SCRIB	24	0	41	55	0	74	87	0	0	0	0	0	257
STEMS	26	0	0	0	0	0	0	0	0	0	0	0	0
CUVOL	26	0	0	0	13	0	0	0	21	0	0	0	34
SCRIB	26	0	0	0	70	0	0	0	115	0	0	0	184
TOTAL-----													
STEMS	0	35	33	26	10	4	2	0	0	0	0	0	110
CUVOL	0	33	77	234	158	106	84	20	21	0	0	0	733
SCRIB	0	7	118	795	637	468	411	108	115	0	0	0	2659

STAND: Horsetooth 15

PER ACRE SUMMARY

STEMS	BA	DBH	HT	AGE
110	46	8.8	43	152

CRUISE SUMMARY

BAF USED= 10 POINTS SAMPLED= 16 AVG. # TREES/PT.= 4.6

STAND: Horsetooth 17

PER ACRE STAND SUMMARY
ALL SPECIES

		HEIGHT CLASS											TOTAL
DBH		20	30	40	50	60	70	80	90	100	110	120	
STEMS 6	21	0	0	0	0	0	0	0	0	0	0	0	21
CUVOL 6	16	0	0	0	0	0	0	0	0	0	0	0	16
SCRIB 6	0	0	0	0	0	0	0	0	0	0	0	0	0
STEMS 10	0	0	8	0	0	0	0	0	0	0	0	0	8
CUVOL 10	0	0	63	0	0	0	0	0	0	0	0	0	63
SCRIB 10	0	0	166	0	0	0	0	0	0	0	0	0	166
STEMS 12	3	0	8	4	0	0	0	0	0	0	0	0	15
CUVOL 12	16	0	94	58	0	0	0	0	0	0	0	0	168
SCRIB 12	27	0	330	222	0	0	0	0	0	0	0	0	579
STEMS 14	0	0	3	2	0	0	0	0	0	0	0	0	5
CUVOL 14	0	0	45	36	0	0	0	0	0	0	0	0	81
SCRIB 14	0	0	171	144	0	0	0	0	0	0	0	0	315
STEMS 16	0	0	1	0	1	0	0	0	0	0	0	0	1
CUVOL 16	0	0	17	0	24	0	0	0	0	0	0	0	41
SCRIB 16	0	0	76	0	113	0	0	0	0	0	0	0	189
STEMS 20	0	0	0	0	0	0	0	0	0	0	0	0	0
CUVOL 20	0	0	17	0	0	0	0	0	0	0	0	0	17
SCRIB 20	0	0	81	0	0	0	0	0	0	0	0	0	81
STEMS 22	0	0	0	0	0	0	0	0	0	0	0	0	0
CUVOL 22	0	0	0	0	25	0	0	0	0	0	0	0	25
SCRIB 22	0	0	0	0	125	0	0	0	0	0	0	0	125

TOTAL													
STEMS 0	24	0	20	6	1	0	0	0	0	0	0	0	50
CUVOL 0	31	0	237	93	49	0	0	0	0	0	0	0	411
SCRIB 0	27	0	824	366	238	0	0	0	0	0	0	0	1455

STAND: Horsetooth 17

PER ACRE SUMMARY

STEMS	BA	DBH	HT	AGE
50	27	9.9	40	72

CRUISE SUMMARY

BAF USED= 10

POINTS SAMPLED= 10

AVG. # TREES/PT.= 2.7

STAND: Horsetooth 19

PER ACRE STAND SUMMARY
ALL SPECIES

		HEIGHT CLASS											TOTAL
DBH		20	30	40	50	60	70	80	90	100	110	120	
STEMS	6	3	21	4	0	0	0	0	0	0	0	0	29
CUVOL	6	5	38	9	0	0	0	0	0	0	0	0	52
SCRIB	6	0	0	-1	0	0	0	0	0	0	0	0	-1
STEMS	8	3	7	7	0	0	0	0	0	0	0	0	16
CUVOL	8	6	24	33	0	0	0	0	0	0	0	0	64
SCRIB	8	23	53	55	0	0	0	0	0	0	0	0	131
STEMS	10	2	3	5	3	0	0	0	0	0	0	0	13
CUVOL	10	6	17	33	27	0	0	0	0	0	0	0	83
SCRIB	10	14	28	73	73	0	0	0	0	0	0	0	188
STEMS	12	0	1	2	6	1	0	0	0	0	0	0	11
CUVOL	12	0	9	22	93	18	0	0	0	0	0	0	142
SCRIB	12	0	23	71	358	73	0	0	0	0	0	0	525
STEMS	14	0	0	2	2	0	2	1	0	0	0	0	7
CUVOL	14	0	0	26	47	0	64	24	0	0	0	0	162
SCRIB	14	0	0	103	204	0	293	112	0	0	0	0	712
STEMS	16	0	0	1	2	0	0	0	0	0	0	0	3
CUVOL	16	0	0	12	61	0	0	0	0	0	0	0	73
SCRIB	16	0	0	51	273	0	0	0	0	0	0	0	324
STEMS	18	0	0	0	0	0	0	0	0	0	0	0	2
CUVOL	18	0	10	11	15	18	21	0	0	0	0	0	76
SCRIB	18	0	45	48	73	86	104	0	0	0	0	0	356
STEMS	20	0	0	0	0	1	0	0	0	0	0	0	1
CUVOL	20	0	0	0	0	35	22	0	0	0	0	0	56
SCRIB	20	0	0	0	0	169	108	0	0	0	0	0	277
STEMS	22	0	0	0	0	0	0	0	0	0	0	0	1
CUVOL	22	0	0	0	0	17	23	0	0	0	0	0	40
SCRIB	22	0	0	0	0	85	115	0	0	0	0	0	199
STEMS	24	0	0	0	0	0	0	0	0	0	0	0	0
CUVOL	24	0	0	0	0	18	0	0	0	0	0	0	18
SCRIB	24	0	0	0	0	91	0	0	0	0	0	0	91

TOTAL													
STEMS	0	8	33	20	14	3	3	1	0	0	0	0	82
CUVOL	0	17	99	147	243	106	130	24	0	0	0	0	767
SCRIB	0	37	149	400	980	504	620	112	0	0	0	0	2802

STAND: Horsetooth 19

PER ACRE SUMMARY

STEMS BA DBH HT AGE

82 44 9.9 46 109

CRUISE SUMMARY

BAF USED= 10

POINTS SAMPLED= 13

AVG. # TREES/PT.= 4.4

STAND: Horsetooth 21

PER ACRE STAND SUMMARY
ALL SPECIES

		HEIGHT CLASS											TOTAL
DBH		20	30	40	50	60	70	80	90	100	110	120	
STEMS	6	31	25	31	0	0	0	0	0	0	0	0	87
CUVOL	6	21	37	93	0	0	0	0	0	0	0	0	151
SCRIB	6	0	0	10	0	0	0	0	0	0	0	0	10
STEMS	8	5	4	9	0	0	0	0	0	0	0	0	18
CUVOL	8	11	13	41	0	0	0	0	0	0	0	0	66
SCRIB	8	43	29	70	0	0	0	0	0	0	0	0	142
STEMS	10	0	6	11	2	0	0	0	0	0	0	0	19
CUVOL	10	0	30	82	27	0	0	0	0	0	0	0	139
SCRIB	10	0	64	185	92	0	0	0	0	0	0	0	341
STEMS	12	0	0	3	0	0	2	0	0	0	0	0	5
CUVOL	12	0	0	47	0	0	40	0	0	0	0	0	88
SCRIB	12	0	0	173	0	0	175	0	0	0	0	0	348
STEMS	14	0	0	1	1	3	0	0	0	0	0	0	5
CUVOL	14	0	0	21	28	65	0	0	0	0	0	0	114
SCRIB	14	0	0	84	120	284	0	0	0	0	0	0	487
STEMS	16	0	0	0	0	3	0	0	0	0	0	0	3
CUVOL	16	0	0	0	0	102	0	0	0	0	0	0	102
SCRIB	16	0	0	0	0	472	0	0	0	0	0	0	472
STEMS	18	0	0	0	1	0	0	0	0	0	0	0	1
CUVOL	18	0	0	0	30	0	0	0	0	0	0	0	30
SCRIB	18	0	0	0	142	0	0	0	0	0	0	0	142
STEMS	22	0	0	0	0	0	0	1	0	0	0	0	1
CUVOL	22	0	0	0	0	0	0	43	0	0	0	0	43
SCRIB	22	0	0	0	0	0	0	215	0	0	0	0	215
STEMS	24	0	0	0	0	0	0	0	0	0	0	0	0
CUVOL	24	0	0	0	0	0	0	44	0	0	0	0	44
SCRIB	24	0	0	0	0	0	0	224	0	0	0	0	224

TOTAL													
STEMS	0	37	34	56	4	6	2	1	0	0	0	0	140
CUVOL	0	32	81	284	85	167	40	87	0	0	0	0	776
SCRIB	0	43	93	522	354	756	175	438	0	0	0	0	2380

STAND: Horsetooth 21

PER ACRE SUMMARY

STEMS	BA	DBH	HT	AGE
140	50	8.1	42	107

CRUISE SUMMARY

EFF USED= 10 POINTS SAMPLED= 7 AVG. # TREES/PT.= 5.0

STAND: Horsetooth 23

PER ACRE STAND SUMMARY
ALL SPECIES

		HEIGHT CLASS											TOTAL
DBH		20	30	40	50	60	70	80	90	100	110	120	
STEMS	6	12	12	0	0	0	0	0	0	0	0	0	24
CUVOL	6	9	19	0	0	0	0	0	0	0	0	0	2
SCRIB	6	0	-7	0	0	0	0	0	0	0	0	0	-
STEMS	8	1	7	3	0	0	0	0	0	0	0	0	11
CUVOL	8	3	21	12	0	0	0	0	0	0	0	0	3
SCRIB	8	11	44	20	0	0	0	0	0	0	0	0	75
STEMS	10	1	4	3	1	0	0	0	0	0	0	0	1
CUVOL	10	4	21	26	8	0	0	0	0	0	0	0	5
SCRIB	10	8	36	68	20	0	0	0	0	0	0	0	132
STEMS	12	1	1	4	1	0	0	0	0	0	0	0	1
CUVOL	12	7	11	47	9	0	0	0	0	0	0	0	74
SCRIB	12	13	30	171	35	0	0	0	0	0	0	0	250
STEMS	14	0	0	2	1	0	0	0	0	0	0	0	4
CUVOL	14	0	6	33	25	0	0	0	0	0	0	0	64
SCRIB	14	0	23	129	103	0	0	0	0	0	0	0	25
STEMS	16	0	0	1	0	0	0	0	0	0	0	0	1
CUVOL	16	0	0	20	0	0	0	0	0	0	0	0	2
SCRIB	16	0	0	83	0	0	0	0	0	0	0	0	8
STEMS	18	0	0	0	1	0	0	0	0	0	0	0	1
CUVOL	18	0	0	6	18	0	0	0	0	0	0	0	2
SCRIB	18	0	0	28	84	0	0	0	0	0	0	0	112
STEMS	20	0	0	0	0	0	0	0	0	0	0	0	0
CUVOL	20	0	0	0	18	0	0	0	0	0	0	0	1
SCRIB	20	0	0	0	87	0	0	0	0	0	0	0	87
STEMS	22	0	0	0	0	0	0	0	0	0	0	0	0
CUVOL	22	0	0	0	8	10	0	0	0	0	0	0	18
SCRIB	22	0	0	0	40	51	0	0	0	0	0	0	90
STEMS	24	0	0	0	0	0	0	0	0	0	0	0	0
CUVOL	24	0	0	0	0	0	23	0	0	0	0	0	23
SCRIB	24	0	0	0	0	0	118	0	0	0	0	0	11

TOTAL													
STEMS	0	16	24	13	4	0	0	0	0	0	0	0	57
CUVOL	0	23	77	145	86	10	23	0	0	0	0	0	36
SCRIB	0	32	125	499	370	51	118	0	0	0	0	0	1190

STAND: Horsetooth 23

PER ACRE SUMMARY

STEMS BA DBH HT AGE

57 26 9.1 38 105

CRUISE SUMMARY

REF USED= 10

POINTS SAMPLED= 23

AVG. # TREES/PT.= 2.6

STAND: Horsetooth 25

PER ACRE STAND SUMMARY
ALL SPECIES

		HEIGHT CLASS											TOTAL
DBH		20	30	40	50	60	70	80	90	100	110	120	
STEMS	6	8	0	0	0	0	0	0	0	0	0	0	8
CUVOL	6	9	0	0	0	0	0	0	0	0	0	0	9
SCRIB	6	0	0	0	0	0	0	0	0	0	0	0	0
STEMS	12	0	2	0	0	0	0	0	0	0	0	0	2
CUVOL	12	0	18	0	0	0	0	0	0	0	0	0	18
SCRIB	12	0	47	0	0	0	0	0	0	0	0	0	47
STEMS	14	0	2	1	0	0	0	0	0	0	0	0	3
CUVOL	14	0	31	12	0	0	0	0	0	0	0	0	42
SCRIB	14	0	110	46	0	0	0	0	0	0	0	0	156
STEMS	16	0	1	0	0	0	0	0	0	0	0	0	1
CUVOL	16	0	20	0	0	0	0	0	0	0	0	0	20
SCRIB	16	0	79	0	0	0	0	0	0	0	0	0	79
STEMS	18	0	0	1	0	0	0	0	0	0	0	0	1
CUVOL	18	0	0	37	0	0	0	0	0	0	0	0	37
SCRIB	18	0	0	162	0	0	0	0	0	0	0	0	162
STEMS	20	0	0	1	0	0	0	0	0	0	0	0	1
CUVOL	20	0	0	25	0	0	0	0	0	0	0	0	25
SCRIB	20	0	0	117	0	0	0	0	0	0	0	0	117
STEMS	22	0	0	0	0	0	0	0	0	0	0	0	0
CUVOL	22	0	0	0	15	0	0	0	0	0	0	0	15
SCRIB	22	0	0	0	73	0	0	0	0	0	0	0	73
STEMS	28	0	0	0	0	0	0	0	0	0	0	0	0
CUVOL	28	0	0	0	0	20	0	0	0	0	0	0	20
SCRIB	28	0	0	0	0	100	0	0	0	0	0	0	100

TOTAL													
STEMS	0	8	6	3	0	0	0	0	0	0	0	0	18
CUVOL	0	9	69	74	15	20	0	0	0	0	0	0	187
SCRIB	0	0	237	325	73	100	0	0	0	0	0	0	734

STAND: Horsetooth 25

PER ACRE SUMMARY

STEMS	BA	DBH	HT	AGE
18	14	12.0	35	113

CRUISE SUMMARY

BAF USED= 10 POINTS SAMPLED= 12 AVG. # TREES/PT. = 1.4

STAND: Horsetooth 27

PER ACRE STAND SUMMARY
ALL SPECIES

		HEIGHT CLASS											TOTAL
DBH		20	30	40	50	60	70	80	90	100	110	120	
STEMS	6	20	0	0	0	0	0	0	0	0	0	0	20
CUVOL	6	15	0	0	0	0	0	0	0	0	0	0	15
SCRIB	6	0	0	0	0	0	0	0	0	0	0	0	0
STEMS	8	4	9	0	0	0	0	0	0	0	0	0	12
CUVOL	8	6	37	0	0	0	0	0	0	0	0	0	43
SCRIB	8	30	69	0	0	0	0	0	0	0	0	0	99
STEMS	10	2	6	6	0	0	0	0	0	0	0	0	13
CUVOL	10	8	35	45	0	0	0	0	0	0	0	0	88
SCRIB	10	15	59	119	0	0	0	0	0	0	0	0	192
STEMS	12	1	3	9	1	0	0	0	0	0	0	0	14
CUVOL	12	8	20	93	19	0	0	0	0	0	0	0	140
SCRIB	12	25	45	303	74	0	0	0	0	0	0	0	447
STEMS	14	0	1	1	1	3	0	0	0	0	0	0	6
CUVOL	14	0	13	17	22	73	0	0	0	0	0	0	126
SCRIB	14	0	47	72	94	314	0	0	0	0	0	0	527
STEMS	16	0	1	0	1	0	1	0	0	0	0	0	2
CUVOL	16	0	11	0	19	0	28	0	0	0	0	0	59
SCRIB	16	0	40	0	84	0	131	0	0	0	0	0	255
STEMS	18	0	0	1	0	0	0	0	0	0	0	0	1
CUVOL	18	0	0	34	0	0	0	0	0	0	0	0	34
SCRIB	18	0	0	152	0	0	0	0	0	0	0	0	152
STEMS	20	0	0	0	1	0	0	0	0	0	0	0	1
CUVOL	20	0	0	0	40	0	0	0	0	0	0	0	40
SCRIB	20	0	0	0	193	0	0	0	0	0	0	0	193

TOTAL													
STEMS	0	27	19	17	4	3	1	0	0	0	0	0	70
CUVOL	0	38	116	189	101	73	28	0	0	0	0	0	545
SCRIB	0	70	261	646	444	314	131	0	0	0	0	0	1865

STAND: Horsetooth 27

PER ACRE SUMMARY

STEMS	BA	DBH	HT	AGE
70	37	9.8	39	72

CRUISE SUMMARY

BAF USED= 10

POINTS SAMPLED= 10

AVG. # TREES/PT.= 3.7

Horsetooth Mountain Park Timber Stand Evaluation

March 1998

Stand #	Acreage	Notes
1	479.5	Not enough trees to sample
3	72	10 plots sampled. Mostly Ponderosa Pine. No dwarf mistletoe encountered in plots, Regeneration varied 100, 100, 300, 100, 7000. Common Understory: Grasses- Big Blue stem, Cheat grass; Mt. Mahogany, currant, Rocky Mt. Maple. Encountered some Bull Thistle in the lower part of the stand.
5	292.2	<p>29 plots sampled. Mixed Ponderosa Pine and Douglas Fir. Encountered 2 stands of Aspen, one along the upper Wathen Trail along the drainage that it follows. Another stand was found along the old Horsetooth Rock trail. This stand is quite variable. It varies from major granite rock outcroppings with poor site indices and no trees to rich north and east facing slopes with high site indices. Dwarf Mistletoe is prevalent in the upper portions of the stand and the lower areas around upper Spring Creek (ratings as high as 7 in some sample trees). We noted one small pocket (less than 1 acre) of beetle infestation along the Wathen trail near the intersection of the Horsetooth Rock trail. We also found a sizable pile of slab wood from a former saw mill site, which could pose a fire hazard, along the Wathen Trail approximately ¼ mile east of the intersection with the Horsetooth Rock Trail. We found a patch of Canadian Thistle in one plot along the Wathen Trail by the spring tank. Approximately 20 acres of this stand are located on the south and west side of Horsetooth Rock, some of this area was burned over during the early 1980's. Understory varied from grasses mixed with Mule's Ear Mullein, Mountain Mahogany, and Currant on the south facing slopes to Mountain Ninebark, Ground Juniper, Rocky Mountain Maple, and Cherry on the richer north facing slopes and bottoms. Regeneration was found in 11 plots: 200, 400, 700, 800, 300, 700, 100, 1400, 300, 100, 900.</p>

Stand #	Acreage	Notes
7	21.5	10 plots. This stand is located on the west side of Horsetooth Rock. It is characterized as VERY STEEP and ROCKY!! Slopes as great as 70°. It contains a mix of Ponderosa Pine and Douglas Fir. The upper slopes on the south side of the stand are somewhat open with a mix of Ponderosa Pine, Mountain Mahogany, and grasses (Big Blue Stem and Little Blue Stem). The north side of the stand is located primarily on a west facing slope along a drainage and is comprised of Douglas Fir and shrubs (Currant, Salmon Berry, Mountain Ninebark, and Ground Juniper). Some Dwarf Mistletoe was found outside of the sample plots along the western edge of the stand (DMR < 5). Regeneration was found in 2 plots (100, 200).
9	56.2.	10 plots. This stand is fairly thick, mostly Ponderosa Pine with some Douglas Fir on the north facing slopes. This stand is located below a large saddle north of Horsetooth Rock, we saw numerous birds passing through the area. Understory is comprised of grasses, Ground Juniper, and Currant. Dwarf Mistletoe was found in 2 plots but was prevalent in the stand. Beetle infestation was found in one plot just above Spring Creek (small area, only 3-4 trees). We found regeneration in most plots (100, 300, 100, 100, 1000, 400, 3300, 6900).
11	149.7	15 plots. Stand is located along upper Spring Creek, evenly mixed Ponderosa Pine and Douglas Fir. We found one stand of Aspen along the bottom of Spring Creek. This stand contains the "Big Tree". This is a 48" X 80' Douglas Fir and is approximately 325 years old. We did encounter a large pocket of beetle infestation (apx. 1 acre). This needs immediate attention in order to control the spread. The pocket is located approximately 200 feet @ 230° from the "Big Tree". We encountered considerable pockets of Dwarf Mistletoe throughout the stand. We sampled at least 1 tree in 6 of the 15 plots sampled. Regeneration was found in 8 of the plots (100, 2100, 1600, 100, 1000, 100, 2100, 100).

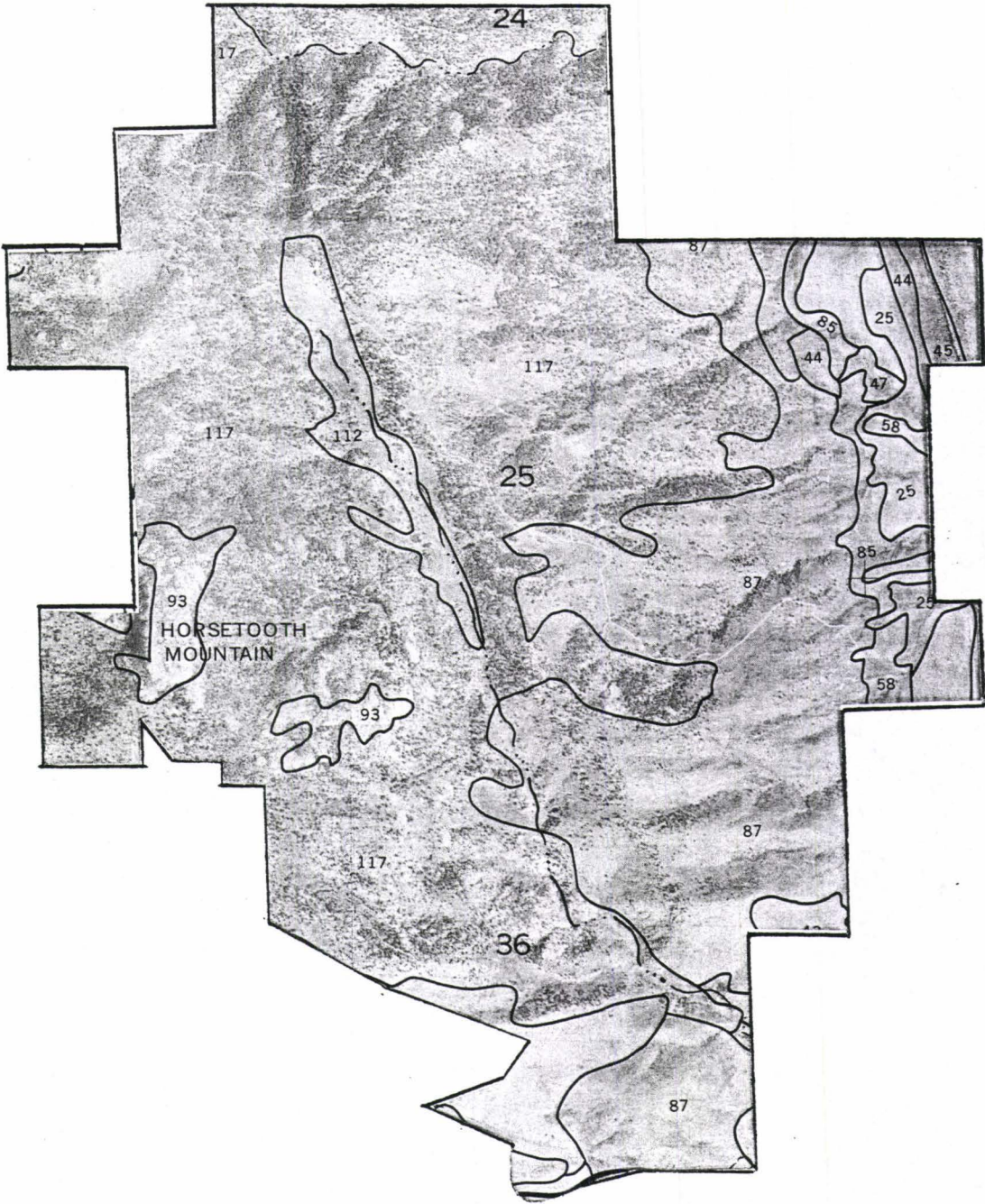
Stand #	Acreage	Notes
13	7.5	10 plots. This was a unique stand of trees that is located on the west side of the park and north of the towers site. The stand is intersected by the towers service road. This is a fairly open stand with mostly Ponderosa Pine and few Douglas Fir along the drainage on the south side of the stand. The stand is situated along a south and east aspect with slopes under 20°. Understory is composed of grasses and forbs, with some Currant, Ground Juniper and Salmon Berry. I encountered 1 scraggly Lodgepole Pine along the ridge on the north side of the stand, this was the only Lodgepole Pine I found in the park. Regeneration was found in 3 plots (100, 300, 100).
15	166.6	16 plots. This stand is located on the south side of Mill Canyon. The stand is situated on a North aspect with slopes in excess of 20°. To say the least, the stand is thick, steep, and rocky. The stand has a very high fuel loading with numerous blow downs and stagnated trees. It needs thinning or prescribed burning to reduce the potential of an intense natural fire. The stand primarily consists Douglas Fir and occasional Ponderosa Pine. Understory is composed of Ground Juniper, Currant, Mt. Ninebark, Rocky Mt. Maple, Cherry, along with some grasses, and an occasional Willow and Water Birch in the creek bottom. Regeneration was encountered in most plots (1100, 500, 1400, 2300, 300, 100, 100, 600, 100, 600, 400, 800, 100, 5400, 2100).
17	44	10 plots. This stand is located on the north side of Mill Canyon and runs along the north boundary with Lory State Park. The stand is fairly steep but open. Aspect is primarily south with slopes of 20- 30°. It is characterized as open Ponderosa Pine with an understory of grasses, Mt. Mahogany and Ground Juniper. We found some Canada Thistle in 1 plot. Regeneration was found in 3 plots (200, 200, 100)
19	134.5	13 plots. This stand runs from upper Spring Creek east to the lower meadow along the reservoir. The stand is fairly steep but open. Aspect is primarily east with slopes of 20- 30°. It is comprised of Ponderosa Pine with occasional Douglas Fir in the understory. Understory is primarily grasses, Mt. Mahogany, and Currant. We found a number of pockets of very healthy Ponderosa Pines with excellent form. Very little Dwarf Mistletoe was encountered. Regeneration was found in 7 plots (2400, 100, 4900, 100, 500, 400, 500).

Stand #	Acreage	Notes
21	98.5	10 plots. This stand runs from the Towers Service Road east to the open meadow along the reservoir. It has an east aspect with slopes of 10- 30 ⁰ . The stand consists primarily of Ponderosa Pine with small scattered openings. Understory consists of grasses, Mullein, Mt. Mahogany, and Currant. We found Dwarf Mistletoe in one plot. Regeneration was found in 5 plots (300, 100, 100, 6600, 1200)
23	239	24 Plots. This stand is bordered on the west by Spring Creek and runs to the east where it is bordered by the east boundary, it includes some of the ridge line on the east side of Spring Creek. Aspect is variable and slope varied from 12 ⁰ to 30 ⁰ . The stand consists of Ponderosa Pine with occasional Douglas Fir on the north facing slopes. Understory was grasses, Mt. Mahogany, Ground Juniper, and Currant. We encountered Dwarf Mistletoe in 7 plots and found some old "beetle kill" trees. We also found a pocket of current beetle infestation (apx. 2 ac.) along the Herrington Trail, near the top of the ridge line. Regeneration was found in 14 plots (100, 100, 200, 100, 600, 4800, 200, 100, 600, 100, 300, 400, 300, 100)
25	303	30 plots. This is a fairly open stand with scattered pockets of Ponderosa Pine. Aspect is variable and slopes vary from 16 ⁰ to 44 ⁰ . Understory is primarily grasses with patches of Mt. Mahogany and some Skunk Brush. We found no Dwarf Mistletoe or beetle infestation in this stand. Regeneration was not found in any of the plots. We saw a large herd of deer (40 -50) along an east facing slope in this stand. We also found a number of shed antlers in the stand, which would indicate that the deer use this area on a regular basis throughout the Winter months.
27	39.8	10 plots. This stand is located along the towers service road and is surrounded by stand 25. It is primarily north facing with slopes of 8 ⁰ to 40 ⁰ . The stand is fairly evenly mixed with Ponderosa Pine and Douglas Fir. Understory is primarily Mt. Mahogany, Ground Juniper, and grasses. Dwarf Mistletoe was encountered in 1 plot but was seen throughout the stand. Regeneration was found in 3 plots (100, 200, 300).

Appendix 7

Soils Information

Horsetooth Mountain Park Soils Map



58- Kirtley-Purner complex, 5 to 20 percent slopes

This complex consists of strongly sloping to moderately steep soils on uplands and valley sides. It is about 45 percent Kirtley loam and about 40 percent Purner fine sandy loam. Kirtley loam is smoother and less sloping, and Purner soil is steeper. Included with these soils in mapping are some small areas that are similar to Kirtley and Purner soils but in which more sandstone fragments are in the profile. The native vegetation is mainly western wheatgrass, blue grama, sideoats grama, rabbitbrush, and other forbs and shrubs. Mean annual precipitation ranges from 14 to 18 inches, mean annual air temperature ranges from 47 to 50 degrees F, and the frost-free season ranges from 115 to 130 days.

The Kirtley series consists of moderately deep, well drained soils that formed in material weathered from reddish brown sandstone and shale. These soils are on uplands and side slopes and are underlain by soft shale at a depth of 20 to 40 inches. In a representative profile the surface layer is reddish brown fine sandy loam about 4 inches thick. Below this is light reddish brown loam about 8 inches thick that is underlain by soft sandstone and shale.

The Purner series consists of shallow, well drained soils that formed in material weathered from reddish brown sandstone. these soils are on uplands and are underlain by sandstone at a depth of 10 to 20 inches. In a representative profile at the surface layer is reddish brown fine sandy loam about 7 inches thick. The underlain material is light reddish brown fine sandy loam about 7 inches thick. Below this is hard reddish brown sandstone.

Permeability is moderate, and the available water capacity is low to medium. Reaction is neutral to mildly alkaline. Runoff is rapid, and the hazard of erosion is severe.

These soils are suited to pasture or native grasses.

The Kirtley soil is a Loamy Foothill range site and the Purner soil is a Shallow Foothill range site.

87 - Ratake - Rock outcrop complex, 25 to 55 percent slopes

This complex consists of steep or very steep soils on mountainsides and ridges. It is about 60 percent Ratake channery loam and about 30 percent Rock outcrop. The Ratake channery loam is less steep. The Rock outcrop is scattered throughout the unit, most commonly near ridgetops and on the steeper slopes. The Ratake series consists of shallow, well drained or somewhat excessively drained soils that formed in material weathered from granite, schist, or phyllite. These soils are underlain by weathered bedrock at a depth of 10 to 20 inches. The native vegetation is mainly blue grama, sideoats grama, slender wheatgrass, mountain mahogany, and ponderosa pine. Mean annual precipitation ranges from 14 to 18 inches, mean annual air

temperature ranges from 44 to 46 degrees F, and the frost-free season ranges from 75 to 100 days.

In a typical soil profile, the Ratake soils have a surface layer of reddish gray channery loam about 10 inches thick. The subsoil is reddish brown very channery loam about 5 inches thick. The underlying material is weathered phyllite or phyllite schist. Included with this soil in mapping is about 10 percent Breece soils along drainageways.

Permeability is moderate, and the available water holding capacity is low. Reaction is neutral. Runoff is rapid, and the hazard of water erosion is severe.

93- Rock outcrop

This mapping unit is bare or nearly bare rock. Included in the mapping unit are areas of shallow and very shallow soils, mainly around the edges of the mapped areas. Runoff is rapid. The hazard of water erosion is severe on the included soils and in adjacent areas that receive runoff.

This unit is used mainly for wildlife habitat and aesthetic purposes.

This unit is not assigned a range site.

This soil is suited to native grasses.

The Ratake soil is a Shallow Loam range site.

112 - Trag-Moen complex, 5 to 30 percent slopes

This complex consists of strongly sloping to steep soils on mountainsides and ridges. It is about 45 percent Trag sandy loam and about 40 percent Moen loam. Trag sandy loam is more nearly level and at the base of slopes, and Moen loam is on ridgetops and higher side slopes. Included with this soil in mapping are about 15 percent areas of Breece soils and Rock outcrop. The native vegetation is mainly blue grama, big and little bluestem, junegrass, slender wheatgrass, bluebunch wheatgrass, fescues, and some forbs, shrubs, and scattered ponderosa pine. Mean annual precipitation ranges from 15 to 18 inches, mean annual air temperature ranges from 44 to 46 degrees F, and the frost-free season ranges from 75 to 100 days.

The Trag series consists of deep, well drained soils that formed in material weathered from granite and schist. These soils are on uplands and side slopes. In a typical soil profile the surface layer is dark grayish brown sandy loam about 9 inches thick. The subsoil is brown clay loam

about 26 inches thick. The underlying material is brown sandy clay loam.

The Moen series consists of moderately deep, well drained soils that formed in material weathered from granite and schist. these soils are on uplands and valley sides and are underlain by granite at a depth of 20 to 40 inches. In a typical soil profile the surface layer is dark grayish brown loam about 5 inches thick. The subsoil is brown clay loam about 18 inches thick. Below this is granite bedrock.

Permeability is moderately slow to moderate, and the available water holding capacity is medium to high. Reaction is slightly acid above a depth of 5 to 9 inches and neutral below that depth. Runoff is medium to rapid, and the hazard of erosion is moderate to severe.

These soils are suited to pasture and native grasses.

This unit is a Loamy Park range site.

117 - Wetmore-Boyle-Rock outcrop complex, 5 to 60 percent slopes

This complex consists of strongly sloping to very steep soils on mountainsides and ridges. It is about 35 percent Wetmore gravelly sandy loam, about 30 percent Boyle gravelly sandy loam and about 25 percent Rock outcrop. The Wetmore soil is in forest, the Boyle soil is in open grassed areas, and the Rock outcrop occurs throughout the unit. Included with these soils in mapping are minor areas of Redfeather and Schofield soils. Mean annual precipitation ranges from 15 to 18 inches, mean annual air temperature ranges from 42 to 46 degrees F, and the frost-free season ranges from 75 to 100 days.

The Wetmore series consists of shallow, well drained soils that formed in material weathered from granite. These soils are underlain by granite bedrock at a depth of less than 20 inches. In a typical soil profile a 2 inch thick layer of organic material is on the surface. The surface layer is dark gray gravelly sandy loam about 2 inches thick. The subsurface layer is pinkish gray gravelly loamy sand about 3 inches thick. The subsoil is pinkish gray very gravelly loamy sand about 11 inches thick. Below this is granite bedrock. The native vegetation is mainly ponderosa pine, Douglas fir, and an understory of grasses and shrubs.

The Boyle series consists of shallow, well drained or excessively drained soils that formed in material weathered from granite. These soils are underlain by weathered granite at a depth of 10 to 20 inches. In a typical soil profile the surface layer is brown gravelly sandy loam about 5 inches thick. The subsoil is brown and reddish brown gravelly or very gravelly sandy clay loam about 8 inches thick. Below this is weathered granite. The native vegetation is mainly blue grama, mountain muhly, Parry oatgrass, needlegrass, and mountain mahogany.

Permeability is moderate to rapid, and the available water holding capacity is low. Reaction is slightly acid to neutral. Runoff is rapid, and the hazard of water erosion is severe.

These soils are suited to woodland or native grass.

The Wetmore soils and Rock outcrop are not assigned a range site. The Boyle series are in a Shallow Loam range site.

Appendix 8

Wildfire Hazard Mitigation and Response Plan