

UPDATED FOREST STEWARDSHIP AND COMMUNITY WILDFIRE PROTECTION PLAN



Prepared for:

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November 15, 2006

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FOREST STEWARDSHIP AND COMMUNITY WILDFIRE PROTECTION PLAN ACCEPTANCE

This management plan is a collaborative effort to guide our stewardship management activities, including wildfire protection. The activities recommended in this plan are appropriate to meet our objectives and will benefit the natural resources and reduce the risk from wildland fire. This plan is voluntary, and where possible, we intend to apply the recommended practices, thus improving our community and increasing public safety.

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WIA Board of Directors

Date

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TABLE OF CONTENTS

ACKNOWLEDGEMENTS	III
LIST OF TABLES	VII
PLAN OBJECTIVES	2
GENERAL DESCRIPTION.....	2
LOCATION.....	2
WOODMOOR HISTORY	2
WIA COVENANTS AND RULES.....	4
HISTORICAL LAND USE	4
LEGAL, SOCIAL, AND ECONOMIC FACTORS AFFECTING FOREST MANAGEMENT	5
COMMON AREAS	5
FORESTRY VOLUNTEERS.....	6
CLIMATE	7
TOPOGRAPHY	7
SOILS	10
MAJOR PLANT COMMUNITIES	13
MAJOR VEGETATION TYPES	14
WILDLIFE SPECIES AND HABITATS	17
ENDANGERED WILDLIFE SPECIES	18
MANAGING FOR HEALTHY FORESTS	18
IMPROVING FOREST HEALTH THROUGH THINNING	18
MOUNTAIN PINE BEETLES (MPB)	19
IPS (“ENGRAVER”) BEETLES.....	21
DWARF MISTLETOE.....	21
CONTROL OF NOXIOUS WEEDS.....	22
MANAGEMENT OF COMMON AREAS.....	23
THINNING	23
GRASS AND NOXIOUS WEEDS CONTROL.....	24
PONDS IN WOODMOOR	25
TEN YEAR MANAGEMENT PLAN FOR COMMON AREAS	26
COMMUNITY WILDFIRE PROTECTION PLAN	27
FACTORS AFFECTING HOMES IN THE WILDLAND/URBAN INTERFACE	27
HOW STRUCTURES CATCH FIRE.....	27
HAYMAN FIRE LESSONS	28
CAUSES OF WILDFIRE IGNITIONS	30
TRI-LAKES MONUMENT FIRE AUTHORITY RESOURCES AND WILDFIRE STRATEGY.....	30
GENERALIZED PRESCRIPTIONS FOR WILDFIRE HAZARD MITIGATION	31
THE HOME IGNITION ZONE:	31
DEFENSIBLE SPACE VS. FUELBREAKS	31

PROTECTING HOMES WITH DEFENSIBLE SPACE	32
HOME CONSTRUCTION AND SURVIVABILITY	33
THINNING FOR FUEL BREAKS	35
PAST FUELS REDUCTION WORK	36
FOCUSING FUELS REDUCTION IN MANAGEMENT UNITS (MUS)	40
NORTH WOODMOOR (MU 1)	40
CENTRAL WOODMOOR (MU 2).	44
SOUTH WOODMOOR (MU 3).....	47
OTHER WILDFIRE PROTECTION RECOMMENDATIONS	50
IDEAS FOR IMPROVING RESIDENT PARTICIPATION	50
SPONSOR FIREWISE COMMUNITY EDUCATION EVENTS.....	51
A 10-YEAR PLAN TO REDUCE WILDFIRE FUELS IN WOODMOOR.....	52
APPENDIX A. CONTROL OF GAMBEL OAK RE-SPROUTING WITH HERBICIDES APPLIED TO STUMPS	53
APPENDIX B. CONTROL OF COMMON NOXIOUS WEEDS	54
APPENDIX C. CONTROL OF CATTAILS	56
APPENDIX D. MAPS.....	57
1) SATELLITE MAP OF WOODMOOR:.....	57
2) WUI (FROM CO-WRAP FIRE RISK) MAP	58
3) FIRE INTENSITY SCALE MAP (FROM CO-WRAP)	59
4) RATE OF SPREAD MAP (FROM CO-WRAP)	60
5) POPULATION DENSITY MAP (FROM CO-WRAP)	61
APPENDIX E. FORMS USED BY FORESTRY VOLUNTEERS FOR FIREWISE EVALUATIONS.....	62
1) FIREWISE HOME AND LOT EVALUATION FORM	62
2) ZONE 2 – MITIGATING RISKS OF A HIGH INTENSITY FOREST FIRE BURNING WITHIN 30 TO 100 FEET OF HOUSE	63

LIST OF FIGURES

FIGURE 1 MAP OF WOODMOOR SHOWING BOUNDARIES AND STREETS.	3
FIGURE 2 MAP OF WOODMOOR’S TOPOGRAPHY AND LANDFORM.....	9
FIGURE 3 MAP OF MAIN SOILS SERIES IN WOODMOOR.....	10
FIGURE 4. MAP OF MAIN VEGETATION TYPES IN WOODMOOR.....	15
FIGURE 5 UNTHINNED PINE FOREST.....	19
FIGURE 6 THINNED PINE FOREST	19
FIGURE 7. WILD DUCK POND AUGUST 2017	25
FIGURE 8. HIDDEN POND AUGUST 2017	25
FIGURE 9. UPPER TWIN POND 2017.....	25
FIGURE 10. LOWER TWIN POND 2017	25
FIGURE 11 DIAGRAM OF DEFENSIBLE SPACE SHOWING THE THREE THINNING ZONES.	31
FIGURE 12 MAP OF WOODMOOR’S WILDFIRE HAZARD CLASSES BASED ON VEGETATION TYPES.....	38
FIGURE 13 NORTH WOODMOOR MANAGEMENT (MU 1) SHOWING VEGETATION TYPES, SINGLE DWELLING LOTS, MAIN ROADS, AND COMMON AREAS (INSIDE RED LINES).	41
FIGURE 14 MAP OF NORTH AND CENTRAL WOODMOOR’S EMERGENCY EGRESS ROUTES. “BLUE” ” ROADS ARE THE MAIN EVACUATION ROADS TO THE “YELLOW” SECONDARY ROADS GOING OUT OF WOODMOOR.	43
FIGURE 15 CENTRAL WOODMOOR MANAGEMENT UNIT (MU 2) SHOWING VEGETATION TYPES, SINGLE DWELLING LOTS, MAIN ROADS, AND COMMON AREAS (INSIDE RED LINES).....	45

FIGURE 16. SOUTH WOODMOOR MANAGEMENT UNIT (MU 3) SHOWING VEGETATION TYPES, SINGLE AND MULTIPLE DWELLING LOTS, MAIN ROADS, AND COMMON AREA (FAIRPLAY MEDIAN).	47
FIGURE 17 MAP OF SOUTH WOODMOOR’S EMERGENCY EGRESS ROUTES. “BLUE” ROADS ARE THE MAIN EVACUATION ROADS TO THE “YELLOW” SECONDARY ROADS GOING OUT OF WOODMOOR.	49

LIST OF TABLES

TABLE 1. LIST OF WIA COMMON AREAS, ACRES, AND DRAINAGE BASINS TO WHICH THEY BELONG.	6
TABLE 2. CLIMATE DATA FROM COLORADO SPRINGS AIRPORT FROM 1951 TO 1973 TAKEN FROM THE USDA NATIONAL COOPERATIVE SOIL SURVEY FOR EL PASO COUNTY.	7
TABLE 3. COMPARISON OF SOME OF THE IMPORTANT PROPERTIES OF WOODMOOR SOILS.	12
TABLE 4. SUMMARY OF VEGETATION TYPES BY SINGLE-DWELLING LOTS AND LOT ACRES	16
TABLE 5. FUEL REDUCTION WORK DONE IN WOODMOOR WITH HELP OF COST-SHARE GRANTS.	36
TABLE 6. CURRENT FUEL REDUCTION WORK DONE IN WOODMOOR WITH HELP OF COST-SHARING GRANTS.	37
TABLE 7. TOTAL NUMBER OF SINGLE-DWELLING LOTS AND LOT ACRES BY WILDFIRE HAZARD CLASSES	39
TABLE 8. NUMBERS OF SINGLE-DWELLING LOTS AND LOT ACRES BY HAZARD CLASSES IN MU 1.	42
TABLE 9. NUMBERS OF SINGLE-DWELLING LOTS AND LOT ACRES BY HAZARD CLASSES IN MU 2.	46
TABLE 10. NUMBERS OF SINGLE-DWELLING LOTS AND LOT ACRES BY HAZARD CLASSES IN MU 3.	48

PLAN OBJECTIVES

This is an update to the current Community Wildfire Protection Plan (CWPP) for Woodmoor. The objectives are:

1. To continue to improve the forest conditions on all of Woodmoor properties thus decreasing fire risk and insect and disease problems.
2. To assess vegetative fuel hazards, risks of wildfire occurrence and homes at most risk in Woodmoor.
3. To update the current 10-year plan for improving forest health, reducing vegetative fuels hazards, and improving community safety.
4. To improve or maintain the quality of wetlands, wildlife habitat, and recreational use of common areas.
5. To provide appropriate updates to our current plan.

GENERAL DESCRIPTION

Location

The community of Woodmoor is located 15 miles north of Colorado Springs on the east side of I-25 (see **Figure 1, page 3**). The boundary on the north is County Line Road (or Palmer Divide Road) and on the south is Higby Road. Woodmoor Drive and Furrow Road mark the western and eastern most boundaries. It is reached by car by taking exit 161 on I-25 to state highway 105. All of the adjacent land is privately owned. The legal location is Township 11 North, Range 67 West.

Woodmoor History

In the 1950's "Woodmoor" was mostly ranch and farmland. Beginning in 1957 a developer began to buy lots with a vision of a semi-rural residential retreat for retired military families, especially those from the nearby Air Force Academy. By 1964, this community was known as Woodmoor. The vision was for large lots with no fences and preservation of the natural beauty of the forests, riparian areas, and open grassland. This objective was accomplished by attaching covenants to all lots in Woodmoor.

The developers formed an incorporated homeowners association (The Woodmoor Improvement Association, Inc.) in 1971. They deeded approximately 140 acres to be used as common areas for all residents. A Board of nine volunteer Directors, all Woodmoor members, is responsible for enforcing the covenants for the benefit of the homeowners. Rules and Regulations have been enacted to help owners interpret the covenants and facilitate their consistent enforcement.

Today Woodmoor has approximately 2,627 single-dwelling lots and 389 denser multiple dwelling lots on a total area of 2,680 acres (including roads, etc.). Single dwelling lot sizes range from 0.3 to 1.5 acres with an average of 0.5 acres. Homes have been built on approximately 2,431 lots to date. Each lot is privately owned. Except for requiring the timely removal of trees infested with Mountain Pine Beetles and dead trees, none of WIA's rules require homeowners to practice good forest management. Owner permission is necessary before going onto their land.

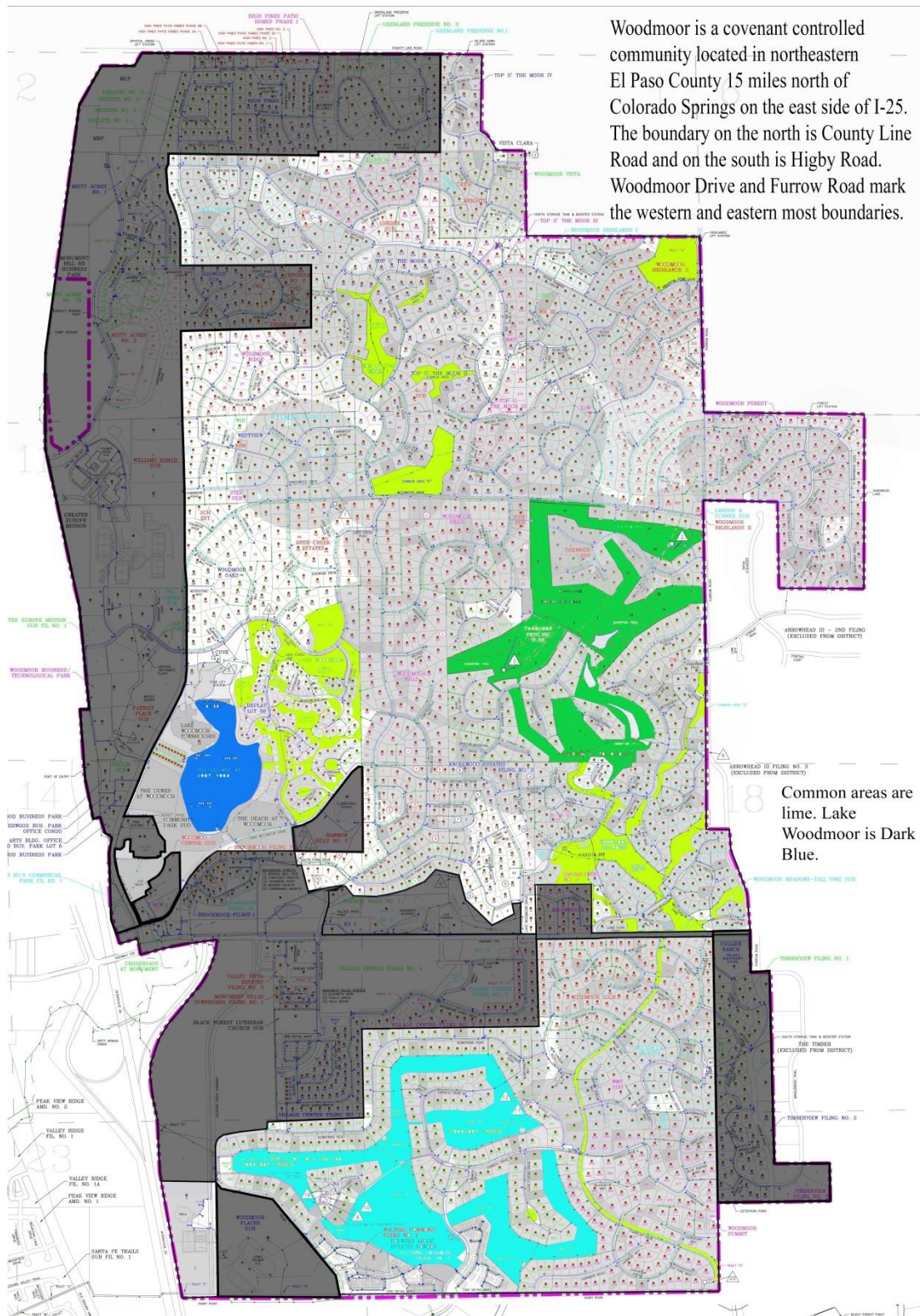


Figure 1 Map of Woodmoor showing boundaries and streets.

Legend for map above:

- Golf Course - Green
- Common Areas – Lime
- Walters Family Trust – Lite Blue
- Lake Woodmoor – Dark Blue
- Areas not a part of Woodmoor are Darkened

WIA Covenants and Rules

Woodmoor is a covenant community. Its rules reflect a common goal of owners to preserve the natural beauty of Woodmoor's forests, wetlands, and grassland. For example, owners need a tree-cutting permit to cut any live pine trees larger than 4.0 inches diameter at 4.5 feet above ground (DBH). Clear cutting is prohibited. Tree cutting permits are needed by everyone who wants to thin their forests, do defensible space thinning, remove live beetle-infested trees, or remove live trees infected by dwarf mistletoe. A Tree Monitor issues these permits to owners after he/she visits the property and evaluates which trees they want to cut. Owners who cut pine trees without a permit are subject to a fine for each tree cut. Woodmoor does make an exception to the permit rule as long as the work being done is within 30 feet of the home. This has been implemented to make it easier for residents to create defensible space close to the home. We do encourage our residents to contact a Forestry Volunteer even in this situation so that we can assist them with this critical task.

Other standards affecting forest management practices are: 1) no open fires – all wood and slash must be disposed of by chipping, disposal in a landfill, or burning as firewood in a fireplace; 2) all dead trees are to be removed within 4 weeks (30 days) after they turn brown; and 3) all wood from trees containing live Mountain Pine Beetles (MPBs) must be disposed of in an approved manner before the beetles begin to fly (June 1 in Woodmoor). No hunting or discharge of firearms is permitted. Fishing is permitted in common area ponds.

Other rules affect the ignitability of some homes. Until 1994, Woodmoor's Architectural Design Standards allowed homeowners to have cedar shake roofs along with the more Fire resistant Slate or Tile roofs. Now, only Class A fire rated roofing materials such as asphalt shingles, slate, tile or metal, may be used and older shake roofs must be replaced with these materials. Approximately 85 of today's homes still have shake roofs. Only natural split cedar rails or round timber fences are permitted. Woodmoor is currently allowing metal or other non-flammable material for fencing for the first five feet from the home. Plank type "privacy" fences are not allowed. Most homes have unscreened wood or wood-composite decks.

Historical Land Use



The forestland near the town of Monument was heavily logged in the mid- to late-1800s. The wood was sawn into lumber and transported by trains to Denver and Colorado Springs. Old photos (like the one to the left showing Wood-

moor in the distance) show a treeless landscape around Palmer Lake and Monument. The climax ponderosa pine forest ecosystem that dominates 60% of Woodmoor appears to have started under older trees that no longer exist.

Before settlement the ponderosa pine forests on the Palmer divide were quite different than they are today. Light ground fires burned through the forest every five to fifteen years. These fires tended to thin the forest and maintain it in an open park-like condition. There were fewer, larger trees with a grassy understory. Different ages of trees were present, contributing to the diversity of the forest.

The post-logging period coincided with the era of fire suppression and trees grew back without thinning by man or by fire. Presently the forest is extremely dense, and the trees are competing for light, water, and nutrients. As a result of these stresses, the forest is most susceptible to mortality from bark beetles infestations and dwarf mistletoe. Worst of all, the forest is more predisposed to devastating crown fires caused by the dense interconnected forest canopy.

The more open areas of pine forest and grassland in the lower elevations were used for grazing livestock. The popular ponds in three common areas were built to store water for cattle by the Civilian Conservation Corps in the 1930's.

The Woodmoor Corporation formed the Woodmoor Pines Golf and Country Club before 1968 (see location in **Figure 1, Page 3**). The first homeowners of Woodmoor were automatically made members. Since then it has changed ownership several times. Today, it is not affiliated with WIA, but is subject to its covenants.

Legal, Social, and Economic Factors Affecting Forest Management

The primary values of Woodmoor forests, as reflected in its covenants and rules, are aesthetic and recreational. Maintaining the area's natural plant and wildlife ecosystems for their intrinsic emotional and spiritual values is a primary management objective. Trees essentially have little or no economic value as wood.

Common Areas

Woodmoor has 15 common areas for use by all residents. Table 1 lists their acreage and connection to the main drainage systems. Their locations are shown on maps in a pamphlet entitled "*A Woodmoor Resident's Guide To Woodmoor Common Areas*" available from WIA.

Table 1. List of WIA Common Areas, acres, and drainage basins to which they belong.

Common Area Name	Acres	Drainage Basin
Toboggan Hill	10.8	Lake Fork
Piney Trail/Lake Woodmoor	23.4	Lake Fork
Twin Ponds	9.98	Lake Fork
The Point	4.4	Lake Fork
The Marsh	13.8	Lake Fork
The Meadows/Playground	29.2	Upper Fork DW
Wild Duck	8.9	South Fork DW
The Ravine	4.2	Middle Fork DW
North Park	12.1	Cherry Creek
Hidden Pond	6.5	Lake Fork
South Woodmoor N.V.E's	4.6	
Lower Lake Road Common Areas	4.75	
WIA Offices/The Barn	1.49	
Common Area B	5.0	
Fairplay Median	5.0	Jackson Creek
Total	140.52	

Small ponds are located in the Hidden Pond, Twin Ponds, Wild Duck, and North Park Common Areas. The North Park and Wild Duck ponds were created to store winter runoff and prevent flooding. A breached dam near Gregg's Pond Lane, (Meadows Common Area), was built for flood control. Toboggan Hill is a community favorite for sledding when there is snow.

All but two of the common areas are located in drainages of Dirty Woman Creek (DW) or Lake Woodmoor (Lake Fork) that empties into Dirty Woman Creek. The North Park Common Area drains eastward into Cherry Creek. A drainage basin study in 1993 by Kiowa Engineering¹ describes the importance of the Dirty Woman drainages during 100-year peak rainfalls. Most WIA common areas would be flooded by extreme rain events.

Forestry Volunteers

The Director of Forestry is responsible for supervising a group of 7 unpaid volunteers who help promote good forest management on homeowner lots and educate them on ways they can reduce the risks of home ignitions by wildfires. These volunteers (called "Tree Monitors") are trained to identify forest insects and diseases and recommend appropriate control methods. They evaluate homeowner lots for wildfire hazards, assist in marking trees for thinning, and provide advice on how owners can make their forests healthier. They also review and approve homeowners' applications for cost-sharing fuels reduction grants. On average they currently make 100 to 120 home visits each year. WIA employs a Forestry Administrator who dispatches the volunteers, coordi-

¹ "Dirty Woman And Crystal Creek Drainage Basin Planning Study, Preliminary Design Report" For El Paso County Department of Public Works, June 1993, by Kiowa Engineering Corp., 419 W. Bijou Street, Colorado Springs, CO; Project 91.07.17, 60 pages, 18 Tables, 9 Figures.

nates most forestry activities, and assists the Director with administrative duties.

When the Forestry volunteer visits a resident's home they take with them the form's shown in APPENDIX E (Page 62) which are used to document the recommendations made and the issues observed at the residents home. Note the forms have copies so that the office, the homeowner and the Forestry Volunteer all get an original of the form.

Climate

The climate of Woodmoor mirrors that of other Front Range communities. There are four seasons. The highest maximum temperatures are in July and August. The lowest minimum temperatures are in December and January. Approximately 75 to 80% of the precipitation falls between April to September in the form of afternoon thunderstorms and showers. In the summer humidity in Woodmoor ranges between 15% and 20%. The three driest months are December, January, and February. Although some snow falls every month from September through May, the probability of large snowfalls is greatest in the spring months of March and April.

Table 2. Climate data from Colorado Springs airport from 1951 to 1973 taken from the USDA National Cooperative Soil Survey for El Paso County.

Month	Ave Daily Temp (F)	Ave Monthly Precipitation (In)	Snow Days 0.10 In +	Ave. Snowfall (in)
Jan.	29.7	0.27	1	4.3
Feb.	32.1	0.32	1	4.7
Mar.	35.7	0.73	2	9.0
Apr.	45.5	1.18	3	7.3
May	55.6	2.26	5	1.3
June	65.4	2.01	0	.0
July	70.7	3.05	0	.0
Aug.	69.0	2.37	0	.0
Sept.	60.8	1.40	3	1.9
Oct.	50.5	0.84	2	3.5
Nov.	37.7	0.49	2	5.2
Dec.	31.2	0.29	1	4.5
Annual Totals	48.7	15.21	20	41.7

These climate trends are reflected above in Table 2 for Colorado Springs. Unofficial climate data for nearby Monument shows that daily average temperatures are 5 degrees cooler than Colorado Springs and annual precipitation is 5 inches greater. Monthly average snowfalls are similar.

Topography

The general topography of Woodmoor is shown below in **Figure 2**. Slope angles range from 0 to 50%. Elevations range from 7,000 feet, near Lewis Palmer High School, to more than 7,500 feet

near Indian Summer Lane. Most of the valleys and low areas in north Woodmoor drain into Dirty Woman Creek or Lake Woodmoor. Small areas in northwest and northeast Woodmoor drain into the Crystal Creek and Cherry Creek Basins, respectively. Most of the ponderosa pine ecosystem grows between 7,200 and 7,500 feet. The natural grassland grows below 7,200 feet elevation.

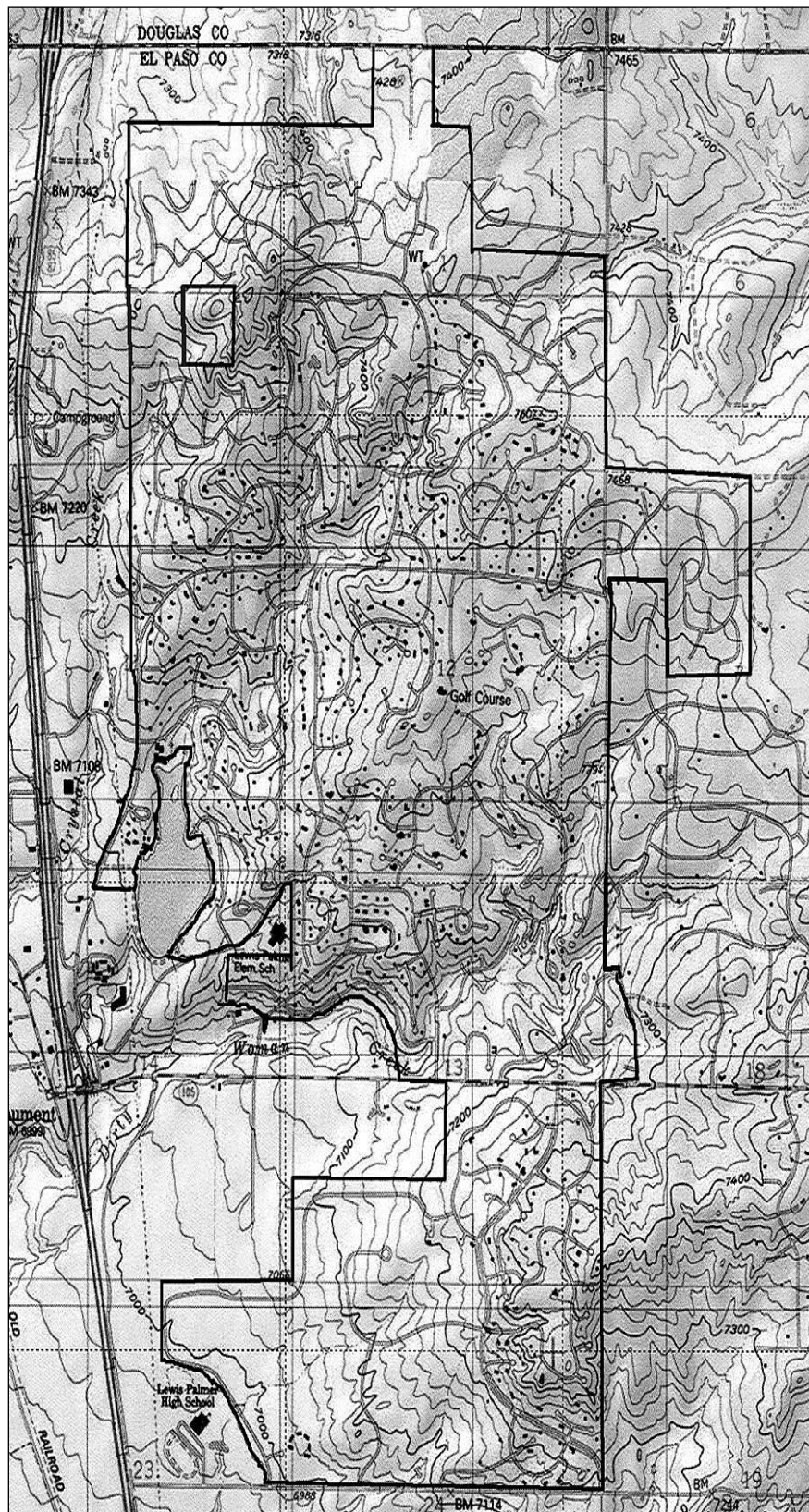


Figure 2 Map of Woodmoor's topography and landform

Soils

The USDA National Cooperative Soil Survey (NCSS) mapped and evaluated the major soil series of El Paso County in 1981. Four of the county's smaller series are found in Woodmoor. **Figure 3** shows their location and extent. The technical descriptions of each one comes from the NCSS website (<https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx>).

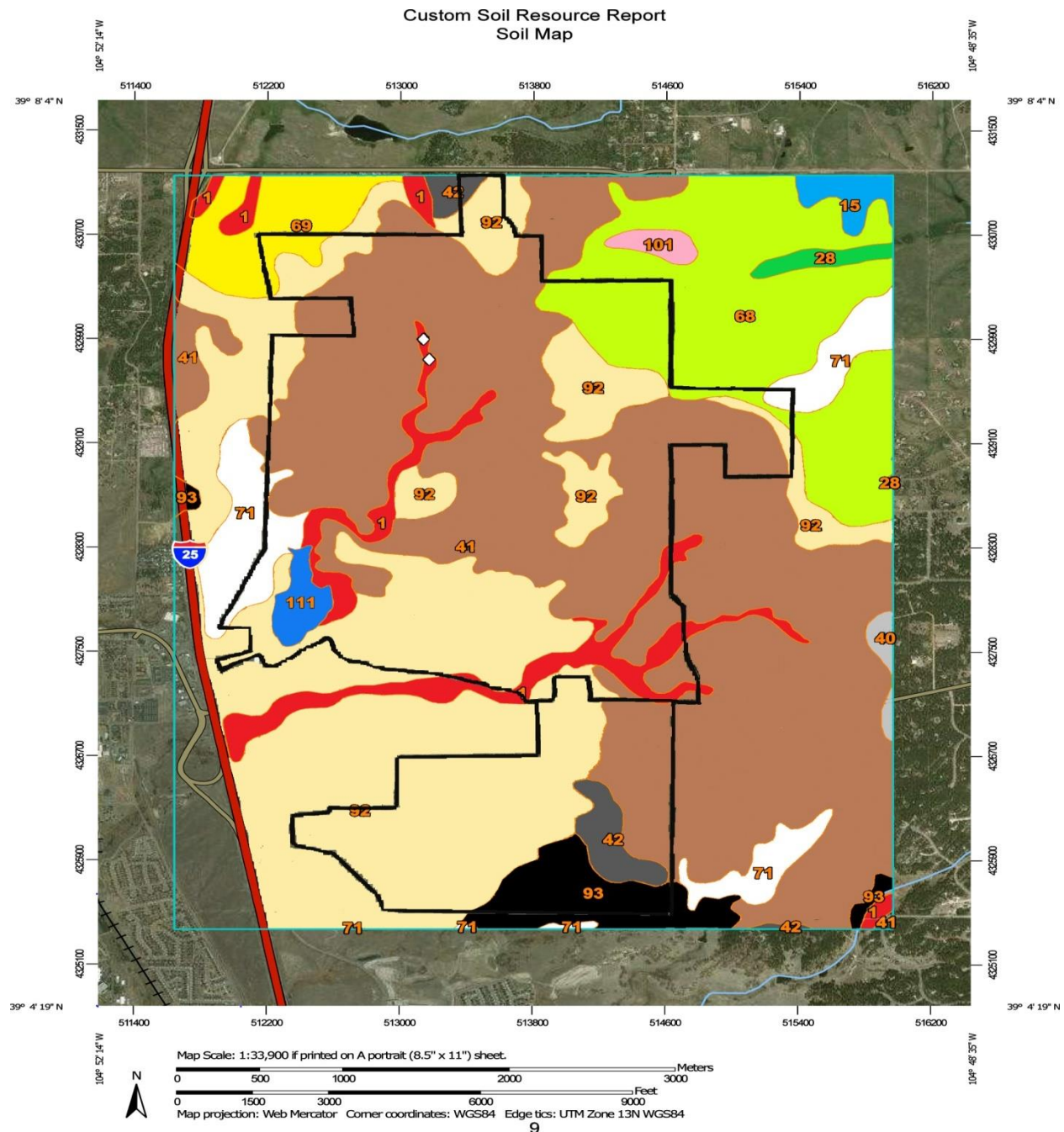


Figure 3 Map of main soils series in Woodmoor

Map Unit Legend (Woodmoor map)

El Paso County Area, Colorado (CO625)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
1	Alamosa loam, 1 to 3 percent slopes	210.6	6.2%
15	Brussett loam, 3 to 5 percent slopes	6.5	0.2%
28	Ellicott loamy coarse sand, 0 to 5 percent slopes	12.6	0.4%
41	Kettle gravelly loamy sand, 8 to 40 percent slopes	1,629.4	47.9%
42	Kettle-Rock outcrop complex	18.8	0.6%
68	Peyton-Pring complex, 3 to 8 percent slopes	514.2	15.1%
69	Peyton-Pring complex, 8 to 15 percent slopes	103.2	3.0%
71	Pring coarse sandy loam, 3 to 8 percent slopes	73.7	2.2%
92	Tomah-Crowfoot loamy sands, 3 to 8 percent slopes	768.3	22.6%
101	Ustic Torrifluvents, loamy	24.1	0.7%
111	Water	40.0	1.2%
Totals for Area of Interest		3,401.4	100.0%

Alamosa soils are found on alluvial flood plains, old lake basins or alluvial fans with slope gradients of 0 to 6 percent. They are deep, poorly drained and relatively fine textured. The top layer of the soil, (known as the A horizon), is 0 to 8 inches thick and a moist dark gray loam. Alamosa soil is usually saturated with water due to a fluctuating water table.

Kettle Gravelly Loamy Sand consists of deep, well to somewhat excessively drained soils that were formed in material weathered from arkose deposits. (*Arkose deposits are coarse sandstone that has formed by the disintegration of granite without appreciable decomposition*). They are located on alluvial fans, till plains, valley slopes and ridges. Slopes range from 2 to 50%. Most of the ponderosa pine in Woodmoor grows on this soil type. The NCSS estimates an average site index of 55 feet. (*Site index is defined as the average total height of the tallest trees at age 100. It represents the long-term growth potential of a tree species on a given soil and climate*).

Figure 3 (page 10) shows a Kettle Outcrop soil in South Woodmoor. Not shown are two smaller outcrops in The Point Common Area and north of Rock Ledge Lane. This soil is characterized by thin gravelly soils with large rocks and boulders.

A small area of **Peyton/Pring Complex** soil is located between Indian Summer Lane and Furrow Road. According to the NCSS, it was formed in thick alluvial fan materials derived from arkosic formations.

Tomah/Crowfoot Loamy Sands is the main soil series on which most of Woodmoor's grass-

land is located. NCSS describes it as a deep, well-drained soil that formed in materials weathered from arkose beds. It is found on alluvial fans and hills or ridges with slopes of 2 to 30%.

Table 3. Comparison of some of the important properties of Woodmoor soils.

Soil Name	Depth	Flooding	Permea-	Avail. Water	Soil
		Frequency	bility	Capacity	Reaction
	<u>In</u>		In/hr	In/In	pH
Alamosa	0-8	Frequent	0.6-2.0	0.16-0.20	6.1-7.3
Kettle	0-40	None	6.0-20	0.09-0.15	5.1-6.5
Peyton	0-12	None	2.0-6.0	0.11-0.13	6.1-7.8
Tomah	0-10	None	2.0-6.0	0.13-0.15	5.6-7.37

The Alamosa soil associated with wetlands and riparian areas has the lowest permeability and is prone to flooding. Kettle soils are very porous and can drain 6 to 20 inches of rain per hour without flooding or runoff. The Peyton and Tomah soils can absorb 2 to 6 inches of rain per hour before it runs off.

The most important soil property affecting trees and vegetation in Woodmoor is “Available Water Capacity” (AWC). It is defined as *“the amount of water that a soil can store that is available for use by plants.”*

In Table 3, AWC is defined as inches of available water per inch of soil. To estimate its importance to plants, these values must be applied to a *“common depth of rooting”* (where 80 percent of the roots occur). Rooting depth affects the total available water capacity in the soil. A soil with a root barrier at 20 inches and an AWC of 0.20 has 4 inches of available water capacity. Another soil with a lower available water fraction of 0.10, would, if the roots extended to a depth of 60 inches, have 6 inches of available water capacity.

The common rooting depth of ponderosa pine in Woodmoor is highly variable. The average estimated depth on undisturbed Kettle soils is 12 inches. The average depth on ridge tops is 6 to 8 inches. Thus, a Kettle soil with a 12-inch rooting depth has a total AWC of 1.08 to 1.80 inches. If it is located on a ridge top, the estimated total AWC is 0.54 to 0.90 inches. This helps explain why periodic long-term droughts tend to kill more trees on ridge tops than on slopes.

The AWC differences between the Kettle, Peyton, and Tomah soil series are not statistically different. Each was derived from coarse sandstone and low decomposition granite. These are inherently drought prone soils. Each soil varies from mild acidic (5.1 pH) to mild basic (7.8 pH) depending on its vegetation cover.

Major Plant Communities

Woodmoor has four main plant communities: ponderosa pine, Gambel oak (“scrub oak”), grassland, and wetlands/riparian. Each one provides unique habitat conditions for various species of animals and birds.

Ponderosa pine

The largest and most visible plant community is the **ponderosa pine** (*Pinus ponderosa*) forest. Ponderosa pine is the “climax” plant species in this community because it is able to reproduce itself from seed. Two other native tree species in this community are **Douglas-fir** (*Pseudotsuga menziesii* var. *glauca*) and **white fir** (*Abies concolor*). They are usually individual trees growing on wetter sheltered slopes in north Woodmoor. The few quaking **aspen** (*Populus tremuloides*) and **blue spruce** (*Picea pungens*) were planted by residents and are not native to Woodmoor.

Ponderosa pine grows in open to very dense stands between 7,200 to 7,500 feet elevations on well drained Kettle soils. The older tallest (dominant) trees are between 150 to 190 years old with heights varying from 35 to 70 feet depending on soil depth and elevation. Average tree diameters 4.5 feet above ground vary from 5 to 16 inches. Tree densities, or stocking levels, range from 50 to 600+ trees per acre. The basal areas² of trees on unthinned lots were estimated to vary between 60 and 200 square feet per acre. It is not possible to get statistically accurate samples of forest data because most of the trees are on private land.

Ponderosa pine is well suited for this soil and climate because it is able to survive many years of drought. Next to fire, its greatest enemies are Mountain Pine Beetle (*Dendroctonus ponderosa*) and Dwarf Mistletoe (*Arceuthobium vaginatum*).

Gambel Oak

Gambel oak (*Quercus gambelii*) has several common names – scrub oak and Rocky Mountain White Oak. Gambel oak usually grows in clumps of many stems coming from a dense, connecting, underground root system that promotes vegetative reproduction. Their unique root systems have shallow “rhizomes” (or horizontal underground stems) and deep-feeding roots. If the above ground stems are removed or injured, the rhizomes send up numerous sprouts to take their place.

The area with the most large clumps of scrub oak is in south Woodmoor near Harness Road and Scrub Oak Way. It is also the primary understory shrub species and “fire ladder” in the pine forests of north Woodmoor between Doewood Lane and Indian Summer Lane.

Grassland

The boundaries of the Tomah/Crowfoot loamy sands in Figure 3 (page 10) outline the location of most of the grassland or prairie vegetation type in Woodmoor. WIA’s landscaping rules require that homes built in this vegetation type must landscape with a minimum of seven deciduous trees, six evergreens, and eighteen different sizes of shrubs.

Wetlands with Grass

² Basal area is defined as the sum of cross-sectional areas of all trees measured 4.5 feet above ground on one acre.

The most common riparian plant species found in this community are **Sandbar** or **Narrowleaf Willow** (*Salix exigua*), **Black** or **Narrowleaf Cottonwood** (*Populus angustifolia*), **cattail** (*Typha* spp.), and various sedges.

Major Vegetation Types

In preparation for mapping, Dave Root (Colorado State Forest Service), Mark Johnston (El Paso County), Bryan Jack (Tri-Lakes Monument Fire Authority), and Jim Woodman (WIA Director of Forestry) made a preliminary survey of vegetation types. They identified 8 broad types to be mapped on a 2003 satellite photo of Woodmoor. The El Paso County Department of Environmental Services provided the photo.

Vegetation type lines were drawn on the photo and field checked for accuracy. Types smaller than 5 acres, or difficult to distinguish from a larger type, were included in the nearest larger vegetation type. The type lines on the photos were transferred into the El Paso County's Geographic Information System (GIS) by Mark Johnston. Photo-maps of the vegetation type lines were printed and field checked for accuracy and corrected as needed. The GIS system calculated the acres. The number of single dwelling and multiple-dwelling building lots, in each vegetation type, were determined from a county parcel map overlaid on the vegetation types.

The definitions of the final vegetation types are:

1. **Wetlands/grass** – primarily areas with periodic flooding that limits vegetation to riparian vegetation and grasses.
2. **Grassland** – primarily treeless areas covered by grass and various weed species associated with overgrazing by cattle. It may have small isolated pine trees or clumps of Gambel oak.

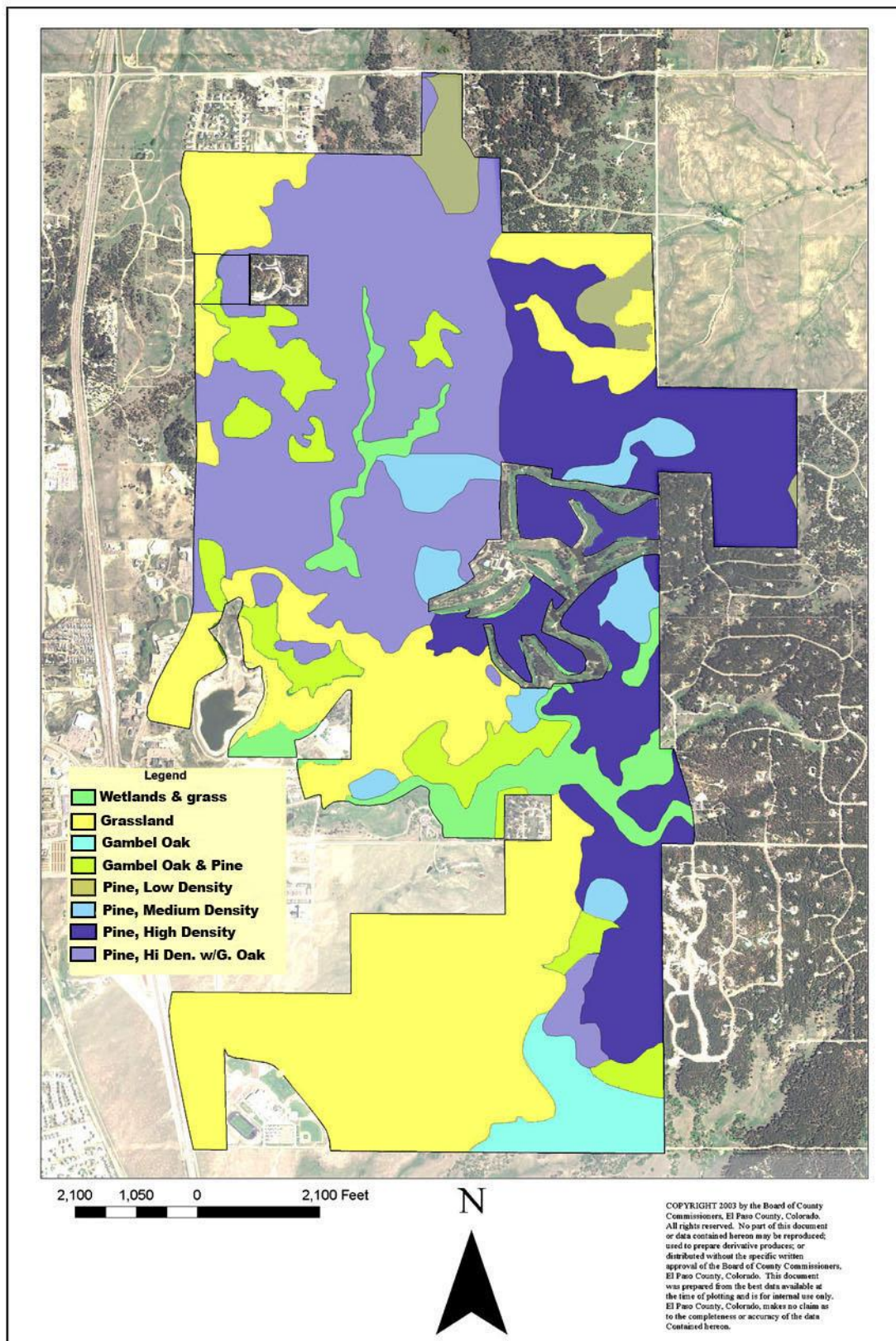


Figure 4. Map of main vegetation types in Woodmoor

3. **Gambel oak** – areas where 20% or more of grassland is covered by small to very large

clumps of Gambel oak.

4. **Gambel oak & low-density pine** – usually vegetation transition areas between Gambel oak to pure ponderosa pine. Gambel oak covers (>50%) of the area. The pine crown cover is less than 20% of the total.
5. **Ponderosa pine-low density** – pine crown cover is less than 20%. The balance of the area is usually in grass and/or a mixture of scattered Gambel oak (<50%) and other shrub species.
6. **Ponderosa pine-medium density** – pine crown cover ranges from 21 to 60%. It may or may not have much shrub understory.
7. **Ponderosa pine-high density** – pine densities range from 61 to 100% of the crown cover. There may be some understory shrubs and pine saplings but they are not likely to be fire ladders to the tree crowns.
8. **Ponderosa pine-high density with Gambel oak understory** – a two-level forest with a widespread understory of Gambel oak, pine regeneration, or other shrub species, growing beneath a dense pine forest. This type is the most hazardous because the Gambel oak and pine regeneration are ideal fuel ladders to the tree crowns.

The location and extent of vegetation types are shown in **Figure 4.(page 15)**. The number of single dwelling lots and estimated total area of these lots are listed in Table 4 below.

Table 4. Summary of vegetation types by single-dwelling lots and lot acres

Vegetation Types	No. of Lots		Lot Acres
Wetlands/grass	57	(2.2%)	25
Grassland	735	(28.0%)	389
Gambel oak	81	(3.1%)	44
Gambel oak & low density pine	124	(4.7%)	62
Ponderosa pine-low density	146	(5.6%)	83
Ponderosa pine-medium density	114	(4.3%)	69
Ponderosa pine-high density	657	(25.0%)	347
Ponderosa pine-high density w/Gambel oak	713	(27.1%)	384
Totals	2,627	(100.0%)	1,392

This table does not include Woodmoor’s 350 high-density townhouses or condominiums, the Village At Moor-Wood (19 units), or the Cove (20 units). All of these developments are located in the Grassland Vegetation Type that has the lowest wildfire risk. If they are added to the single-dwelling lots, the total number of lots in Woodmoor is 3,016.

Table 4 shows that 1,835 (69.9%) of the approximately 2627 single-dwelling lots are located in the Gambel oak or a pine vegetation type. Approximately 66.8% of all single-dwelling lots are located in a ponderosa pine forest. The Grassland and Wetlands/grass vegetation types have 792 lots. If the townhouse and condominium lots are included, the actual or potential number of homes in Grassland or Wetlands is 1,181.

Wildlife Species And Habitats

A major contribution to the quality of life in Woodmoor is the abundance of wildlife. Most of the following animal and bird species live in the ponderosa pine forest. A few are found in the grassland and riparian habitat types.

Common Name	Scientific Name	Preferred Habitat
Red fox	<i>Vulpes fulva</i>	open pine forest and grass areas
Coyote	<i>Canis latrans</i>	grassland and open space
Tassel-Eared/Abert Squirrel	<i>Sciurus aberti</i>	ponderosa pine forest
Eastern Fox Squirrel	<i>Sciurus niger</i>	ponderosa pine forests
Raccoon	<i>Procyon lotor</i>	trees near streams or ponds
Desert Cottontail Rabbit	<i>Sylvilagus auduboni</i>	Gambel oak
Porcupine	<i>Erethizon dorsatum</i>	pine trees
Mule deer	<i>Odocoileus hemionus</i>	pine forest and brush areas
Black bear	<i>Ursus americanus</i>	pine forest; very rare
Mountain lion	<i>Felis concolor</i>	very rare; 1-2 sightings a year

Some of the most visible bird species seen over a year are:

Common Names	Scientific Names
Black Bird, Red Wing	<i>Agelaius phoeniceus</i>
Bluebird, Mountain	<i>Sialia currucoides</i>
Chickadee, Black-Capped	<i>Parus atricapillus</i>
Crossbill, Red	<i>Loxia curvirostra</i>
Crow	<i>Corvus brachyrhynchos</i>
Dove, Rock	<i>Columba livia</i>
Duck, Mallard	<i>Anas platyrhynchos</i>
Duck, Mexican	<i>Anas diazi</i>
Duck, Pintail	<i>Anas acuta</i>
Flicker, Red-Shafted	<i>Colaptes cafer</i>
Goldfinch, American	<i>Spinus tristis</i>
Goose, Canadian	<i>Branta canadensis</i>
Grosbeak, Black-headed	<i>Pheucticus melanocephalus</i>
Grosbeak, Evening	<i>Hesperiphona vespertina</i>
Heron, Great Blue	<i>Ardea herodias</i>
Hummingbird, Ruby-Throated	<i>Archolochus colubris</i>
Hummingbird, Rufus	<i>Selasphorus rufus</i>
Jay, Blue	<i>Cyanocitta cristata</i>
Jay, Stellers	<i>Cyanocitta stelleri</i>
Junco, Oregon	<i>Junco oreganus</i>
Junco, Slate-Colored	<i>Junco hyemalis</i>
Junco, White-Winged	<i>Junco aikenii</i>
Magpie, American	<i>Pica pica</i>
Nutcracker, Clark's	<i>Nucifraga columbiana</i>
Nuthatch, Pygmy	<i>Sitta pygmaea</i>
Nuthatch, Red-breasted	<i>Sitta canadensis</i>
Nuthatch, White-breasted	<i>Sitta carolinensis</i>
Robin	<i>Turdus migratorius</i>

Woodpecker, Downy
Woodpecker, Hairy

Dendrocopos pubescens
Dendrocopos villosus

Endangered Wildlife Species

Although there is no evidence that Woodmoor has any endangered wildlife species, it is possible that some Preble's Meadow Jumping Mice (PMJM) (*Zapus hudsonius preblei*) may inhabit some riparian vegetation.

The PMJM is a small brown rodent with a conspicuous dark dorsal band. It has large hind legs and feet. It is notable for its extremely long tail that is 60% of its total length. It hibernates seven months of each year. Its preferred habitat are drainages bordered by tall willows or forbs such as cattail (*Typha latifolia*), Nebraska sedge (*Carex nebraskensis*) and other sedges. It is most commonly found where there are nearby pasture grasses including Kentucky and Canada bluegrass. It also likes Canada thistle and toadflax.

In 1985, G.S. and D. B. Jones³ reported capturing a specimen off Winding Meadow Road in a wet depression below Wild Duck Pond. A rodent trapping study⁴ in 1996 included selective sites in the Wild Duck and Meadows Common Areas. No PMJM were captured. However, these scientists did find them in other drainages of Dirty Woman Creek, Monument Creek, and the Air Force Academy.

The most favorable habitats for PMJMs in Woodmoor are the Twin Ponds, The Meadows, and Wild Duck Common Areas. These common areas are managed to protect the riparian vegetation that is the mouse's preferred habitat. The federal Endangered Species law prohibits ground-disturbing activities within 300 feet of the 100-year flood plain of the mouse habitat. WIA will not approve any ground-disturbing activities where this species might live.

MANAGING FOR HEALTHY FORESTS

Improving Forest Health Through Thinning

Approximately 1,500 Woodmoor homeowners have potentially unhealthy forests that need to be thinned. They are the owners of High and Severe wildfire hazard lots shown in **Table 7** (Page 39) of the Community Wildfire Protection Plan section.

“Survival Of The Fittest”. Trees in forests compete for a finite amount of light, soil moisture, and soil nutrients. Trees that are taller and have the greatest needle mass are better competitors for these limited resources than smaller trees. Suppressed and intermediate size trees live under continual environmental stress that is exacerbated by the larger trees. As a consequence, the most stressed trees are the ones that grow the least, are most likely to be attacked by bark beetles, and are more likely to die from periodic droughts.

³ Canadian Field-Naturalist, 99:378-380, 1985.

⁴ Second-Year Survey For Preble's Meadow Jumping Mouse (*Zapus hudsonius preble*) in Colorado” by C. A. Meaney, N. W. Clippinger, A. Deans, and M. O'Shea-Stone; 1996. Contract study for the Colorado Division of Wildlife. (Copy available in WIA office)



Figure 5 Unthinned pine forest



Figure 6 Thinned pine forest

Tree Spacing Based On “D + 7 Rule”. Studies have shown that ponderosa pine forests are more healthy and resistant to insects, diseases, and wildfire when they have an average spacing that approximates adding “7” to the average diameter number of 10 or more trees in the forest. To make this calculation, measure the average circumference of 10+ sample trees 4.5 feet above ground. Multiply the circumference by 0.318 to convert it to diameter inches. If the average diameter of 10+ trees is 8 inches, the recommended average distance between the trees should be 15 feet (8 + 7). In practice, some trees will be closer together and others further apart. The goal is to get an average spacing of 15 feet between all trees.

Figure 5 and Figure 6 compare a very dense unthinned pine forest with a healthy thinned one. The smaller and weaker trees (shown in Figure 5 with red dots) should be removed to give more light, soil moisture, and nutrients to the larger and healthier trees. This reduces the environmental stress of the remaining trees and helps them resist drought and bark beetles. Only the healthiest, tallest, and best-formed trees should remain after thinning.

Thinning should not be considered a one-time event any more than mowing a lawn or weeding a garden is a one-time event. Trees and shrubs grow constantly and will need to be periodically thinned again to keep the forest healthy. The “D + 7 Rule” can be used to determine when and how many trees should be cut.

Mountain Pine Beetles (MPB)⁵

The greatest killers of ponderosa pine trees in the western USA are Mountain Pine Beetles (*Dendroctonus ponderosae*). They also attack and kill lodgepole pine (*Pinus contorta*) and limber pine (*Pinus flexilis*). Occasionally they attack Bristlecone and pinyon pine. Although the last four species are native to Colorado, they are not native to Woodmoor. MPBs have a one-year life cycle. For Woodmoor, some adult beetles begin to fly in late June and attack the weakest trees that are stressed by competition, drought, and dwarf mistletoe.

⁵ “Mountain Pine Beetle” by D. A. Leatherman, Trees & Shrubs Fact Sheet No. 5.528, 4 pp., Colorado State University Cooperative Extension,

The female beetle bores a hole in the bark and builds a gallery (or tunnel) that goes upward between the inner bark (cambium) and wood (xylem) of the tree (see side picture). A male beetle joins her and fertilizes an average of 70 eggs. Approximately two months later, the eggs become small larvae. Over the next 7 to 10 months the larvae feed on the inner bark and develop individual galleries radiating out from the central one. These galleries disrupt the upward movement of water from the tree's roots and downward movement of carbohydrates from needles to roots. The tree is killed when the MPB galleries completely "girdle", or disrupt, the movement of water and carbohydrates required to keep the tree alive. Although the tree is technically dead when this happens, the needles often remain green until the following spring when lack of water causes them to rapidly turn brown.



MPBs carry a fungus that makes a blue stain in the xylem tissue of trees. Although it was recently believed that the fungus killed the trees by plugging up the water conducting vessels, recent studies indicate girdling by larvae is probably the main cause of death.

Most trees infested by MPBs produce pitch tubes where the beetle has entered the bark. The natural defense system of trees is to "pitch" out the foreign intruder. Tubes with red boring dust indicate that the beetle was successful in infesting the tree. White or yellow pitch tubes usually indicate that the beetle was probably not successful. In dry years, some infested trees may be too weak to produce pitch tubes. Once a tree is infested by enough MPBs to girdle it, it will die. The larvae that become adult beetles will emerge from their host trees approximately one year after their parents infested them.



In Woodmoor, the normal period of MPB flights is from July 1 to October 1. The peak number of flights per week occurs between late July and mid-August.

Management Recommendations. Unfortunately, once a pine tree becomes infested, the management objective is to prevent future attacks on other trees by disposing of beetle infested wood before the MPBs can exit the tree. High value pine may be sprayed with a protective insecticide of Carbaryl (brand name "Sevin") or Permethrin (brand name "Astro") prior to the beetle flights. The bark surfaces should be drenched from the base up to a 4-inch diameter on the trees. There are no chemicals that can kill beetles after they are inside a tree's bark.

The current WIA Tree Evaluation Request/Removal Permit form lists the only approved methods of disposing MPB infested trees or wood in Woodmoor. They are:

1. Burn infested wood in a fireplace or wood stove before July 1.
2. Remove bark from infested logs to expose and kill the beetle larvae.
3. Chip or grind up the infested wood.
4. Transport infested wood to a "safe place" that is at least one mile from the nearest pine forest.

5. Bury the infested wood in a public landfill.
6. Dry the bark of infested logs with direct sunlight for 6+ hours per day. The logs should be laid side-by-side and periodically rotated. This method needs to be started before May 1 to be effective.
7. Two-foot lengths of infested wood may be stacked two logs deep, wetted thoroughly with water, covered and sealed with thick (6 mils) clear (not black) plastic. It must be done in a sunny location so that inside temperatures retard beetle growth and promote a fungus that kills the larvae. This method needs two warm months to kill the beetles.

Ips (“Engraver”) Beetles⁶

Four species of Ips beetles (*Ips intege*, *Ips pini*, *Ips knausi*, and *Ips calligraphus*) attack ponderosa pine in Woodmoor. Fortunately they are not as destructive as Mountain Pine Beetles. They bore holes and create galleries in tree trunks and branches. This girdling often causes individual limbs and/or treetops to die. Usually the beetles emerge from the top of the tree and attack the living portions below until the entire tree is killed. Rarely are whole trees killed in Woodmoor.

An important difference between Ips and MPBs is that Ips beetles have 2 to 4 generations of offspring in one year compared to only one for MPBs. The first Ips flights can begin in early March and the last one ends in October.

Ips beetles generally attack pines that are weak, injured, or been stressed by drought or dwarf mistletoe. They are attracted to trees near freshly cut wood and slash. Ips infestations often attract MPBs that may end up killing the trees.

The most visible sign of Ips attacks is red boring dust at the base of the tree. Removal of the bark shows larvae galleries that have a “Y” or “H” shaped pattern.

Management Recommendations. Reduction of stresses in trees by thinning is the best preventative for Ips attacks on mature trees. Freshly-cut wood or slash should be chipped or removed to a safe area or landfill within six weeks from the time the trees were cut. Green firewood should not be stacked between live trees. High value trees can be protected with the same preventative insecticide used for MPBs. However, several applications will be needed over a season beginning in late winter.

Dwarf Mistletoe⁷

The most common parasite on pine trees in Woodmoor is Dwarf mistletoe (*Arceuthobium vaginatum*). This small, leafless, flowering plant (see side photo) grows into the bark and phloem of the tree. It produces root-like structures called “sinkers” that become embedded deep into the wood as branches and trunks grow. The sinkers provide the parasite with water and nutrients from the host tree. Mistletoe grows slowly and the time between infection and first-time seed production is six to eight years.

⁶ “Ips Beetles” by W. Cranshaw and D. A. Leatherman; Trees & Shrubs Fact Sheet No. 5.558, 4 pp., Colorado State University Cooperative Extension

⁷ “Dwarf Mistletoe Management” by W. R. Jacobi and C.E. Swift; Diseases Fact Sheet No. 2.925. 3 pp. Colorado State University Cooperative Extension



Mistletoes spread slowly from tree to tree. Their seed are dispersed in August and early September by an explosive discharge from its fruit. Seed can shoot out for distances up to 40 feet. The seeds are sticky and adhere to any surface they strike. If they adhere to branches, the seed germinate and penetrates the bark. Only about 1% of the seed land on pine branches and cause new infections.

Dwarf mistletoes kill trees by robbing them of food (carbohydrates) and water. Infected trees decline in needle mass and die from the top down as lower infected branches take more food and water. The length of tree survival depends on the tree size, tree vigor, and severity of infection. Heavily infected trees are very susceptible to drought and bark beetle attacks.

Management Recommendations. The control strategies for ponderosa pine dwarf mistletoe depend on the owner's objectives. Normally they are: 1) to control the spread of dwarf mistletoe to other pine trees OR 2) to prolong the life of infected trees until disease resistant trees planted under them have become established.

Hawksworth and Johnson describe the most common management recommendations⁸. If the trees are lightly infected and mistletoe shoots are mostly confined to lower tree branches, the infected branches can be removed, or they can be sprayed with a chemical to cause the mistletoe shoots to fall off. Physically or chemically removing the shoots does not kill them and new reproductive shoots will return after a few years. Foresters rarely recommend removal of shoots since it only prevents seed production until new shoots re-emerge. It does nothing to reduce the debilitating effect of the parasite on the host tree.

The only control option for trees with mistletoe infections on most branches is to cut the most heavily infected trees. The forest does not need to be clearcut. The number of trees removed depends on the landowner's objectives. After this is done, owners should underplant them with tree species that are not susceptible to dwarf mistletoe infections. Appropriate species are Douglas-fir, white fir, and Colorado blue spruce. These non-susceptible trees all require the shade and shelter of the existing stand to become established.

Caution should be taken that a dangerous wildfire hazard is not created by under planting. Often disease resistant trees are planted directly under pines where they will become ladder fuels. Also, non-susceptible trees should be planted a minimum of 20 feet apart in openings so that they do not become a dense forest as they grow up.

Control of Noxious Weeds

Noxious weeds are native or non-native plants that authorities have classified as invasive and noxious. Legally they are any plants designated by the Federal, State or county government as injurious to public health, agriculture, recreation, wildlife or property.

⁸ "You Can Save Your Trees From Dwarf Mistletoe" by F. G. Hawksworth and D.E. Johnson, USDA Forest Service, Gen. Tech. Report RM-225, March. 1993.

The Colorado Noxious Weed Act has set priorities of noxious weed control statewide. All Noxious weeds listed by the Colorado Department of Agriculture have been divided into A, B and C lists. They are defined:

List A - rare species that are subject to eradication wherever detected statewide in order to protect neighboring lands and the state as a whole.

List B - species with discrete statewide distributions that are subject to eradication, containment, or suppression in portions of the state designated by the commissioner in order to stop the continued spread of these species.

List C - widespread and well-established weed species for which control is recommended but not required by the state, although local governing bodies may require management.

The Colorado Noxious Weed Act and El Paso County ordinances require that landowners with weed species on Lists A and B control them so that they cannot spread to other properties. Failure to do so can result in enforcement by the El Paso County Environmental Services Department.

Three common noxious weeds in Woodmoor are on List B. They are: Canada Thistle (*Cirsium arvense*), Spotted Knapweed (*Centaurea maculose*), and Yellow Toadflax (*Linaria vulgaris*). Each is described briefly along with recommended control methods in Appendix B⁹ (page 46).

MANAGEMENT OF COMMON AREAS

WIA is responsible for the management of approximately 140 acres in 15 common areas. More than half of this land is covered with grass and/or wetlands vegetation. Pine and/or mixtures of pine and Gambel oak cover approximately 30 to 35 acres. Four areas have small ponds. All of the forest management recommendations described in the preceding sections apply to the common areas.

The primary management issues in common areas are:

1. Performing annual evaluation of each common areas to determine if any new thinning or pruning is required.
2. Control of re-sprouting Gambel oak.
3. Control of grass and noxious weeds.

Thinning

Currently all of Woodmoor's 15 common areas (see Figure 1, page 3) have been thinned to the D+7 rule as described in the section on MANAGING FOR HEALTHY FORESTS starting on page 18. At this time the major concerns for our common areas are addressing the Gambel Oak, and annual evaluation to determine if there is sufficient understory growth to merit the

⁹ WIA's website has photos and recommended control methods for these and other common noxious weeds in El Paso County (see www.woodmoor.org/For_Comm_Areas/noxious_weeds.htm). A helpful pamphlet is: "Noxious Weeds And Controls - Noxious Weeds. You Gottem? You Gittem!" from the El Paso County Environmental Services Dept. and CSU Cooperative Extension.

need for additional thinning.

Management Recommendations:

1. All previously thinned areas in common areas should be visited annually to determine the extent and need for maintenance thinning and control of Gambel oak.
2. Gambel oak re-sprouts in thinned areas should be removed using equipment that will pull the plant out by the roots. This is more environmentally sound than using herbicides and has a 95% effectiveness against regrowth. Woodmoor is currently doing this.

Grass And Noxious Weeds Control

Approximately 60 to 75 acres of grass in the common areas are mowed one to two times each season. The objectives of mowing are: 1) aesthetics, 2) reduce the risk of a wildfire spreading through tall dry grass, and 3) reduce the spread of Canada thistle and other noxious weeds. None of the wetlands or riparian vegetation is mowed. The timing and frequency of mowing is determined by seasonal weather conditions and the growth stages of Canada thistle.

Most noxious weeds grow in the wetter drainages near running water. The most common ones are Canada thistle and Diffuse Knapweed. Yellow Toadflax usually grows on well drained sites.

Each weed species is sufficiently different that chemical or mechanical treatments (mowing) should be customized to control or eliminate them. For example, Canada thistle needs to be stressed by mowing so that it cannot produce seeds. Emerging plants need to be sprayed with approved herbicides in the spring and after the last frost (2 sprays).

Yellow Toadflax should never be mowed because this stimulates its spread. It can only be controlled by annual herbicide applications when it is flowering. The herbicide most effective on Yellow Toadflax is not effective on Canada thistle. See **Appendix B** (page 54) for more detailed information on these and other noxious weeds in Woodmoor.

Management Recommendations:

1. The location and extent of all noxious weeds in common areas should be mapped annually in late July.
2. An annual mowing and herbicide plan should be developed each spring using the maps. Mowing and herbicide spraying should be customized to the target noxious weed. When necessary, backpack spraying or ATV-sprayer applications should be used where the extent of a weed species is fairly small. If possible, spraying should be limited to areas where noxious weeds are actually growing so that other forbs and wild flowers are not killed
3. A set of photo points or plots should be established in each common area to monitor the effects of mowing and spraying treatments on noxious weeds. Photos should be taken before the spraying season and two months afterward in order to estimate the effectiveness of the spraying.
4. Future WIA contracts with commercial herbicide applicators should require a minimum nox-

ious weed kill of 75% within 45 days of treatment. (This is the standard clause written in El Paso County spray contracts.)

Ponds in Woodmoor

Woodmoor has the following ponds that provide for recreational use for our residents:

Hidden Pond
Upper Twin Pond
Lower Twin Pond
Wild Duck Pond

These ponds are currently stocked with fish for recreational use but are also available as a source of water should it be needed in the event of a wildfire event in Woodmoor.



Figure 7. Wild Duck Pond August 2017



Figure 8. Hidden Pond August 2017



Figure 9. Upper Twin Pond 2017



Figure 10. Lower Twin Pond 2017

Ten Year Management Plan For Common Areas

Year 2018

1. Prepare annual plan for mowing grass in the common areas.
2. Make annual evaluation of pine in common areas for Mountain Pine Beetle infestation, winter mortality, wind breakage and remove according to appropriate forest management practices.
3. Evaluate re-sprouting of Gambel Oak in Fairplay Median and other thinned areas to determine the need for re-cutting and/or removal.
4. Evaluate common areas to determine if additional thinning or limbing up of trees is necessary.
5. Map locations of List A and List B noxious weeds in common areas. Develop customized herbicide treatment plans appropriate to each species.
6. Take pictures of noxious weeds in photo points established in 2007. Add additional new photos points if needed. These photos should be taken close to the September or October dates of the previous years' photos.

Year 2019

1. Prepare annual plan for mowing grass in common areas.
2. Make annual evaluation of Ponderosa Pine in common areas for Mountain Pine Beetle infestation, winter mortality, wind breakage and remove according to appropriate forest management practices.
3. Evaluate re-sprouting of Gambel Oak in Fairplay Median and other thinned areas to determine the need for cutting and/or removal using equipment that will pull the Gambel Oak out at the roots.
4. Evaluate all common areas and do "maintenance" thinning, and limbing up of trees as needed.
5. Map locations of List A and List B noxious weeds in common areas. Develop customized herbicide treatment plans appropriate to each species.
6. Take pictures of noxious weeds in photo points established in 2007. Add additional new photos points if needed. These photos should be taken close to the dates of the previous year's photos.

Year 2020 to 2028

1. Prepare annual plan for mowing grass in common areas.
2. Make annual evaluation of pine in common areas for Mountain Pine Beetle infestation, winter mortality, wind breakage and remove according to appropriate forest management practices.
3. Evaluate all common areas and do "maintenance" thinning, and limbing up of trees as needed.
4. Evaluate re-sprouting of Gambel Oak in all thinned common areas to determine the need for re-cutting and/or removal.
5. Map locations of List A and List B noxious weeds in common areas. Develop annual customized herbicide treatment plans appropriate to each species.
6. Take pictures of noxious weeds in photo points on or near dates of pictures taken in preceding years. Add new photo points as needed.

Community Wildfire Protection Plan

Factors Affecting Homes in the Wildland/Urban Interface

Approximately 1,752 Woodmoor lots are in a forested Wildland/Urban Interface (WUI) – see **Table 4** (page 16). The homes on these lots have various risks of being destroyed by a wildfire. The amount of risk depends on the vegetative fuels, materials used in house construction, topography, and random weather events. It is important to recognize these conditions and factors in order to make appropriate decisions about vegetative fuels reductions.

Fuels. The two fuel types in a WUI are vegetative and structural. Vegetative fuels consist of living and dead trees, bushes, and grasses. Typically, grasses ignite more easily and burn more quickly but with less intensity than trees. Any dead or living branches on the lower eight feet of trees or shrubs between 6 and 18 inches tall underneath trees are considered ladder fuels. Ladder fuels help convert a ground fire to a crown fire (tree tops) that moves much more quickly and with more heat. Non-vegetation fuels include houses (due to their close spacing in Woodmoor), ancillary buildings, fences, and firewood piles.

Weather. High temperatures, low humidity, and strong winds from the southwest to west increase the possibility of home ignitions and the difficulty of control. Short and long-term droughts exacerbate the problem.

Topography. Slope is the upward or downward incline or slant of terrain. Hot gases rise in front of the fire along the slope face, pre-heating the up-slope vegetation and moving grass fires up to four times faster with flames twice as long than a fire on level ground. Natural drainages act as chimneys that funnel heat and winds up the drainage. Homes in drainages, or at the tops of drainages, are particularly vulnerable to wildfires.

How Structures Catch Fire

There are three ways that a wildfire can transfer itself from natural vegetation, or burning homes, to other homes. They are through radiation, convection, and firebrands.

Radiation. Wildfires can spread to a home by radiating heat in the same way a radiator heats rooms in the wintertime. Radiated heat is capable of igniting combustible materials from a distance of 100 feet.

Convection. Direct contact with flames, or the wildfire's convective heat column, may also ignite a home. This is most likely to occur when trees or brush near a structure ignite and the flames touch a flammable part of the structure.

Firebrands. Firebrands are burning materials that detach from a fire during strong convection drafts in the burning zone. Firebrands can be carried long distances – more than a mile – by the winds associated with a wildfire. Many of the older homes in Woodmoor were built with shake

roofs and are particularly vulnerable to firebrands.

A 2006 report by Traci Weaver¹⁰ emphasized the danger of home ignitions from burning embers. Multiple wildfires raged across prairie and shrub land in North Central Texas from Dec. 27, 2005 to April 30, 2006. They killed 17 people, burned 1.6 million acres, and destroyed 440 homes. Many of the destroyed homes were made of brick, stone, and had metal roofs. Investigators pinpointed the main cause of home destruction to burning embers that fell on top of, or were blown under, wooden porches without screening. Other losses were linked to firebrands entering attic vents, eaves and soffits, or radiant heat of burning grass that ignited wood decks.

Hayman Fire Lessons

The 2002 Hayman Fire was Colorado's most devastating forest fire. It burned 138,000 acres and 132 homes in 20 days. Surprisingly, 662 homes within the parameter of the fire were not destroyed. USDA Forest Service scientists Jack Cohen and Rick Stratton reported on the causes of home destruction in the "Hayman Fire Case Study"¹¹. Many of the homes that survived did so without intervention by firefighters. The study objective was to determine if there were common factors among these surviving homes that might be helpful in preventing loss of homes in future wildfires.

They found that "torching" or intense crown fires within 30 feet of a structure destroyed 70 homes. If a house was destroyed but the surrounding trees did not burn, they assumed that embers or firebrands ignited it. Based on this logic, they concluded that 62 (47%) of the 132 homes destroyed in the Hayman Fire were ignited by surface fires or firebrands.

Cohen and Stratton found that home destruction was related more to a house and its site-specific surroundings than to the context of the larger Hayman Fire. If the vegetation around a house allowed high intensity fires to burn near them, they did not survive. If the vegetation permitted only low intensity fires, the structures had a good probability of surviving. Flammability of roofs, siding materials, and other house construction features raised or lowered the risk of flames igniting homes.

Waldo Canyon Fire lessons¹²¹³

The Waldo Canyon WUI fire started on June 21, 2012, just southwest of Colorado Springs, Co. By the time the blaze was declared contained on July 10, 2012, it left two people dead, destroyed 344 homes and damaged more than 100, burned 7,384 hectares (18,247 acres) and cost an estimated \$454 million in insurance losses. This fire was investigated by the Department of Commerce's National Institute of Standards and Technology (NIST) and is the most comprehensive examination in history of a wildland urban interface (WUI) fire. The investigation focused on the Mountain Shadows community in Colorado Springs, the location of all of the homes destroyed in

¹⁰ "Texas Fires Shed New Light On What It Means To Be Firesafe." By Traci Weaver. Texas Forest Service. Email: tweaver@tfs.tamu.edu

¹¹ "Hayman Fire Case Study" compiled by Russell T. Graham, Sept. 2003, USDA Rocky Mountain Research Station, Report RMRS-CTR-114, 396 pages.

¹² NSIT article written by Michael E. Newman.

¹³ The Waldo Canyon Fire: Fires on the Colorado Front Range and Home Destruction A report to the Pike and San Isabel National Forests Rick Stratton, Long-term Fire Analyst.

the fire. This study yielded 37 technical findings amongst them are the following key findings:

- WUI fire dynamics change rapidly and require special consideration. “For example, if your home is nestled deep within a neighborhood away from the leading edge of a fire, you might not be at risk early on,” Maranghides said. “However, the danger to your home dramatically increases if a neighboring house, the surrounding landscape or a nearby vehicle catches on fire.”
- WUI fires create “cascading ignitions.” The intensity, spread and destructive power of a WUI fire increases rapidly as more and more structures are ignited. In the Waldo Canyon Fire study, the researchers found that only 48 of the destroyed homes were ignited directly from the wildfire. Structure-to-structure spread from these early ignitions resulted in the cascading ignition of the other 296 destroyed homes.

From another report by Rick Stratton we have learned that there is a ~100ft zone around our home referred to as the home ignition zone (HIZ). He also emphasized the importance of focusing on the home itself not just the vegetation around the home. He also pointed out that the HIZ must be designed with multiple exposures in mind—firebrands from the advancing flame front, convective and radiant heat from the burning fuel, and post-frontal combustion (residual burning). Finally he pointed out that in areas of Mountain Shadows where there was no overlap in HIZ from house to house the main causes of home ignitions were wooden roofs and wooden decks that extended into the surrounding, flammable vegetation.

Black Forest Fire

The Black forest fire began on June 11, 2013 near Highway 83 and Shoup Rd. By the time this fire was considered 100% contained on June 23, 2013 14,280 acres (22.31 sq miles) were burned and approximately 509 homes were destroyed making this the most destructive Wildfire in Colorado history.

As documented in the “Black Forest Fire Assessment Team Report to The Governor of Colorado” the main lessons learned from this fire were:

1. Defensible spaces are critical for ensuring firefighter safety and effectiveness.
2. It is critical that all home owners in a community create defensible space on their properties. If this is not done then the efforts of some homeowners can easily be overwhelmed by wildfire from adjoining properties. For more information on Defensible space see “Protecting Your Home from Wildfire”, CSFS Quick Guide Series, Fire 2012-1 for further information.
 - a. In the case of the Black Forest fire this study showed that of 40 homes with minor or no damage 25 had defensible space in place. In contrast of 31 homes that were destroyed only 7 appeared to have defensible space in place.
 - b. This study of the Black forest fire also emphasized the importance of a new term “Home Ignition Zone” or HIZ. This is an area wide enough to influence wildfire behavior before it reaches the area immediately surrounding the home/structure. Depending on fuel type this area extends a minimum of 100 feet to as much as 300 feet from the home/structure when adjusted for slope
3. Where forest fuels have been treated, tree losses and resource damage are significantly reduced.
4. Structural hardening is just as important as treatment of surrounding native fuels. Ember ignitions of structures were a major contributor to wildfire intensity.
5. Community wide mitigation was found to be most effective in managing wildfire; even during extreme burning conditions.
6. The often stated (but rarely heard) part of the defensible space message is: there are no guaran-

tees. We need to think of this as “risk management” rather than “risk elimination.” As a result of this fire a new term of “Survivable Space” is being introduced.

7. This study showed that crown fire impact in Black Forest was even across the sampling for destroyed homes regardless of defensible space being in place or not, but surface fire impact was less destructive with defensible space in place. The study did go on to mention that if proper mitigation is done in zone 1 (30 feet from the home) and zone 2 (and additional 70 feet from the home) crown fire survivability does go up as there were homes in heavily treed areas that survived with little or no damage from the crown fire due to the mitigation done in the HIZ.

Finally this study mentioned some of the reasons most frequently given by homeowners for not mitigating their properties. Woodmoor and their forestry team will need to be aware of the following and be prepared to address them with individual homeowners as well as the overall community:

“That’s why I have insurance.”

I want to save the ‘natural’ appearance.”

“I moved here for the trees. I’m not cutting them down.”

“I don’t want to destroy the wildlife habitat.”

“I need the trees/brush for my privacy.”

“Mitigation will destroy my property values.”

“Mitigation means clearcutting.”

“I can’t afford it.”

“I can’t physically do the work.”

“I don’t have time.”

“It won’t happen to me.”

“There’s nothing I can do.”

Causes of Wildfire Ignitions

According to the records of the Tri-Lakes Monument Fire Protection District, the most likely causes of wildfire ignitions in Woodmoor are, in order of importance: 1) lightning strikes, 2) a house fire igniting adjacent vegetation that spreads through tree crowns to other houses, and 3) careless or thoughtless acts by people who smoke, set off fireworks, build open fires, etc.

Tri-Lakes Monument Fire Authority Resources and Wildfire Strategy

The Tri-Lakes Monument Fire Protection District is responsible for the control and suppression of all residential and wildfires in Woodmoor. It operates out of three fire stations with the closest one to Woodmoor located on Woodmoor Drive.

The current daily staffing of 12 personnel includes 1 Battalion Chief, 3 Company Officer (Captains or Lieutenants), and 8 Firefighter/Emergency Medical Technicians (EMTs). They are organized into teams, or crews, that operate two Advanced Life Support Ambulances, two Engine Companies, and one Truck Company. In the event of a structure or wildland fire the ambulance crews become members of the Engine, Truck, or Brush truck crews.

The Tri-Lakes Monument Fire Protection District is a member of a mutual aid consortium of eight fire departments in northern El Paso County and southern Douglas County. A fire alarm call to Tri-Lakes automatically goes to these other departments who send at least one truck and crew to the address of the potential fire. Thus, up to 10 trucks and 46 firefighters are initially dis-

patched to every fire.

The response time goal for the department is to reach any location in the Tri-Lakes Monument district in 8 minutes or less. The average response time for Woodmoor is close to 5 minutes. If the severity of the fire warrants, additional personnel and equipment can be requested from other fire departments including those from Colorado Springs, state, and federal agencies.

The El Paso County Sheriff's department would be notified soon after the "Incident Commander" (*officer in charge of the first response team of firefighters*) evaluates the fire situation and determines additional assistance is required. Upon their arrival, the sheriff's deputies would receive instructions on which roads should be closed and telling residents to evacuate their homes if the Incident Commander recommended this. Officers from the Monument Police Department, Palmer Lake Police Department, and Woodmoor Public Safety would assist the sheriff's deputies with their duties.

The priorities of the "first responding" firemen are:

- 1 — Insure the safety of the lives of the firefighters and people (residents) in and near the fire ("incident").
- 2 — Evaluate the fire situation, assign firefighters to specific duties to control and suppress the fire, and notify the sheriff and other agencies on the situation.
- 3 — Restrict the loss of homes and other property.

A wildfire that starts in grass or Gambel oak and spreads into the tops of pine trees is very difficult to control. Many homes in this kind of extreme wildfire situation cannot be protected.

Generalized Prescriptions for Wildfire Hazard Mitigation

The Home Ignition Zone:

Modification of vegetation around a structure to reduce fire intensity is called defensible space. The term "home ignition zone" (HIZ) is defined as a structure and the surrounding vegetation. A structure's vulnerability to wildfire depends on the surrounding vegetation, including landscaping, and the structure itself.

Defensible Space vs. Fuelbreaks

In a broad sense there are two generalized categories of mitigation. First is defensible space thinning around structures to increase the chance that the structure will survive a wildfire. Second, is fuel break thinning away from structures to reduce severe fire behavior and give firefighters a safer place

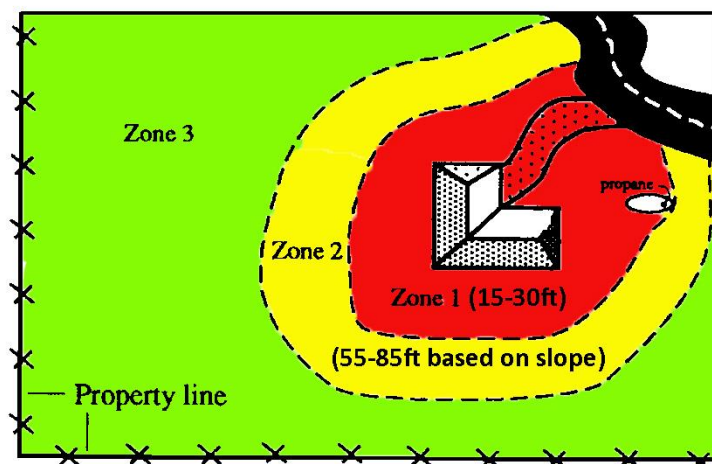


Figure 11 Diagram of defensible Space showing the three thinning zones.

to work and possibly halt an approaching wildfire. Both approaches require thinning of the canopy and removal of ladder fuels. As noted in the previous section, the approach will vary depending of the forest conditions existing on the area in question.

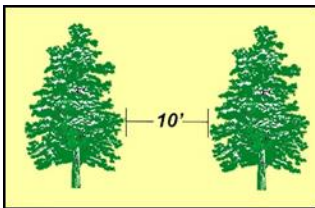
Protecting Homes with Defensible Space

Woodmoor has promoted the application of Defensible Space thinning to reduce the risks of home ignitions since 1991. Thinning around homes is different than thinning for fuel breaks. Thinning in the HIZ is designed to protect structures from the heat of wildfires. Defensible space includes both thinning around structures to reduce the heat from burning vegetation and reducing flammability of the structures to protect them from wind borne embers, radiation and convective heat. Further information about increasing the survivability of structures is found on the CSFS website at: <http://csfs.colostate.edu/pages/pub-csfs2.html#wildfire>.

Defensible space is defined as an area around a structure where existing vegetation is modified to slow the rate and intensity of an advancing wildfire. This includes selective removal of trees around structures in two or three concentric management zones. On slopes, increase the width of each zone on the downhill side. Fuels are reduced according to prescriptions for each zone.

Zone one: This is the closest zone to a structure, and extends 15-30 feet from the outer most edge of a structure including any decks. The management goal is to reduce or eliminate most large trees or shrubs within this zone so that they convective heat will not ignite the structure. A few tall trees may be left in zone one if the lowest branches are pruned so that they are well above a fire resistant roof. It is best to limit this to one or two trees near a structure. Treat such trees as part of the structure and create 15-30 feet of space outside the tree.

Zone two: The width of zone two depends on the slope around the house. The District Forester, (Woodland Park District, Colorado State Forest Service), allowed WIA to simplify the distance calculations to make them easier for residents to apply. If the average slope angle is less than 5%, Zone 2 extends out 55 feet from Zone 1 (70 feet total distance around the house). If the slope is more than 5%, Zone 2 extends 85 feet from Zone 1 (100 feet total) on the downhill side of the house. The distances on the other house sides are 55 feet.



The main fuels reduction guideline for zone two is to thin the trees to an average spacing of 10-foot crown separation. Clumps of two or three trees may be retained in this zone if the space between the clump and the adjoining trees is at least 30 feet. All ladder fuels under trees should be removed. The branches of large trees should be pruned to a height of 8 feet above ground, but small trees should have at least two-thirds of the green needles remaining.

Firefighters must be able to escape quickly if conditions suddenly deteriorate. Zone two should extend along both sides of driveways for a width of 30 feet from each edge of the drive. This is important to allow safe access and egress for emergency vehicles. Adequate clearance should be maintained to allow access to large structural fire trucks.

Twelve feet of horizontal clearance and 13 feet of vertical clearance should be maintained. At the end of driveways, adequate room for a large fire engine to turn around should be maintained.

Zone three: Very few lots in Woodmoor are large enough to have a Zone 3. The guideline for zone three is to thin the forest primarily to improve forest health. Spacing is less critical in this area but some spaces should be made in the canopy. A useful rule of thumb is that a tree should receive sunlight from all four sides. Woodmoor has always recommended using spacing based on the “D + 7 Rule in this zone when it is present on a lot. This is described on page 19.

There is a publication available titled *Landowner Guide to Thinning* that is an excellent reference. The booklet is available on the CSFS Website at:

http://csfs.colostate.edu/pdfs/landowner_g4thin_scr.pdf.

One comment should be made about the publication’s recommendation that trees should be thinned to an average tree spacing based on the “D+7 Rule”. After reading the booklet, many landowners feel that this arbitrary spacing should be the primary objective when thinning. The spacing rule should be considered a guideline but not the objective of a thinning project. In fact, the primary objective is always to leave the healthiest trees. It should not be to achieve a predetermined spacing.

Home Construction and Survivability

The construction materials, location and even the shape of a structure influence its vulnerability to wildfire.¹⁴ It is not the intent of this CWPP to suggest extensive alterations to homes that already exist in the community. Understanding how home construction affects the vulnerability of the structure to a wildfire helps residents plan defensible space projects to compensate for construction differences. When remodeling or home improvement projects are done plans can be made to reduce the ignitability of the buildings.

Decks and roofs are the most vulnerable parts of a structure. If either burns, the home will be lost. They are most likely to catch windblown firebrands, and air currents are more likely to form eddies that trap heat and in the irregular surfaces found in roofs and decks.

Fire restive roofs are extremely important. *Wood shake roofs have been the cause of many home losses due to firebrands.* Roof material with a class A rating indicates the best resistance to fire. Many roofing materials are available to homeowners but they vary in cost, weight and longevity. Homeowners should consult with a reputable building contractor to determine which roofing material will best suit their needs.

Even the most fire resistant roofs require maintenance. The most important item is to keep the roof—and gutters--free of debris. Combustible debris on a roof such as leaves and pine needles may ignite from firebrands and start the home on fire even with a class A roof. Combustible litter is most likely to accumulate in areas where one shape meets another such as gables and dor-

¹⁴ Bueche, David, Tim Foley, Peter Slack, (2012): *Firewise Construction: Site Design and Building Materials*. Colorado State Forest Service.

mer windows. Gutters will also accumulate debris. These same areas are most likely to accumulate firebrands because of eddies in wind currents during a wildfire. Combustible debris should be removed anytime it accumulates. Gutter should be metal since plastic gutters may burn.

The eaves (the extension of the roof over the outside wall) are also vulnerable areas. Open eaves, with the roof joists exposed, are particularly vulnerable because the irregular surfaces can trap hot gasses and fire brands. Enclosure of exposed eaves (called a soffit) helps prevent this. It is best to construct soffits so that the lower edge of the soffit meets the wall at a 90° angle. This reduces the amount of heated air and fire brands that might be trapped.

Vents, in roofs and foundations, are also areas of vulnerability, but are necessary to ventilate attics and crawl spaces to prevent moisture accumulation. During a wildfire, heated gasses and firebrands can enter attics or crawl spaces through vents. All vents should be screened with metal screening with openings of 1/4 inch or less. Soffit vents should be located as close to the edge of the eave as possible. Vegetation around foundation vents can create unintended vulnerability, particularly on the downhill side. Landscaping with stone or rock around crawlspace vents is recommended.

In addition to the roof, decks are extremely vulnerable to fire. The deck surface is exposed to fire brands and fire brands can collect underneath decks. Possibly the worst mistake any homeowner can make is to store any combustible material beneath a deck. Countless homes have been lost because of firewood, scrap lumber, even gasoline stored under a deck. Even motorized equipment, when left under a deck, with gas in the tank has caused home losses during fires.

Ideally the underside of decks should be enclosed with a non-combustible material. If that is not possible, covering the area under a deck with stone, concrete or rock mulch will make the deck safer. When decks are rebuilt use fire resistant materials.

Carefully consider the landscaping in the vicinity of decks as well. Avoid planting flammable shrubs, such as junipers, anywhere near decks or foundations. Potted plants or planters on decks may also increase the hazard. Even furniture with cushions or wooden frames may ignite from firebrands. The area of defensible space should be increased near decks, especially on the downhill side.

Fire resistance of windows and doors should be considered. If window glass breaks, firebrands will enter the house. The most fire resistant glass is low emissivity, tempered glass which withstands the heat of a fire for the longest period. Double pane windows last longer than single pane when exposed to the heat of a fire.

Window frames are also important. Metal frames offer the best protection. Vinyl frames usually do not burn but can melt when exposed to heat. Wooden frames will burn. Metal screening with on the outside of windows offers additional protection, but most windows are sold with nylon screening that will melt. Solid metal shutters offer the best protection, assuming the homeowner has the opportunity to close them before evacuating.

Wooden doors are obviously able to burn during a fire. The thicker the door the more resistant it will be. Metal doors are far superior, and glass in doors is subject to the same vulnerabilities as window glass. Well maintained weather stripping in outside doors will help prevent fire brands from entering a home.

Thinning for Fuel Breaks

Fuel Break thinning is most analogous to zone two of survivable space except that rather than being centered on a structure, fuel breaks are linear. Because winds and preheating from flames tend to push fires uphill, ridge tops (as opposed to midslope fuel breaks) are superior locations. Many fuel breaks are centered on roads. It is desirable to place fuel breaks along roads to provide safer evacuation routes from communities during wildfires, and the access provides firefighters a safer and more convenient place to attack an approaching fire.

On flat terrain, a fuel break should have a minimum width of 300 feet. Wider fuel breaks are always superior, and where they are located on slopes, width should be increased. Where fuel breaks are located on slopes, the spacing between tree crowns should also be increased. Refer to the CSFS publication *Fuel Break Guidelines for Forested Subdivisions and Communities* available from the Woodland Park District or on the web at:

http://csfs.colostate.edu/pdfs/fuelbreak_guidelines.pdf

One objective of any mitigation project should be to enhance the diversity of forest stands. Bitter experience has shown that when all trees are the same species and the same age, catastrophic losses to insects or disease are sure to follow. Most insects or diseases are specific to certain species of tree and certain ages. Thus, diverse forest stands are less prone to complete mortality from one cause. If a forest stand consists of one species attempt to leave trees of different ages, or thin in such a way that regeneration of new trees is promoted. A forester can recommend methods of thinning that reduce fire hazard and increase forest diversity.

When thinning for fuel breaks it is not necessary, or even desirable, to remove all dead trees or pick up all dead wood from the forest floor. Some standing dead trees, or snags, should remain as habitat for wildlife. The most desirable snags are trees larger than ten inches in diameter that are widely spaced. Avoid leaving more than three snags per acre. Do not leave dead trees in zones one and two of defensible space or where they might fall across roads or power lines.

Likewise, some down wood is desirable. Large concentrations of down woody material should be removed, but isolated down logs in varying degrees of decay can remain as cover and habitat for small mammals.

While it is wise to rake up pine needles from zone one of a defensible space, it is not necessary to do so elsewhere. Needles on the forest floor act as mulch retaining moisture in the soil, reduce erosion, and add organic matter to the soil as they decay. If regeneration of new trees is an objective, however, it is desirable to expose some bare soil since this will promote seed germination and establishment.

Woodmoor's guide to defensible space entitled "*Protecting Your Home From Wildfires With Defensible Space*" is available from the WIA office.

Gambel Oak – A Special Case.

Homes located in dense Gambel Oak shrub areas need to modify the Defensible Space guidelines for their special situation. Gambel oak is more flammable than pine and can produce flames that extend 2.0 to 2.5 times its height. The heat generated by a unit of burning oak is 40% greater

than that for a unit of ponderosa pine. For these two reasons, it is recommended that Zone 1 be 20 to 30 feet from a structure. All oak should be eliminated within this zone.

In Zone 2, the shorter oak stems with low-growing branches should be removed first. Instead of a spacing goal of 10-foot crown separation, spacing for Gambel oak should be to 3 to 5 feet between the stems. The branches on the remaining shrubs should be pruned up to 50% of their total height.

Gambel oak is notorious for re-sprouting quickly after being cut. If nothing is done to prevent re-sprouting, the new vegetation will likely become denser and taller than the original oak within 2 to 3 years. The most cost-effective method for preventing re-sprouting is to apply an approved herbicide to oak stumps within 2-3 minutes after cutting. This should be done after the Gambel oak has fully leafed out and before it begins to lose its leaves in the fall. For additional information on recommended herbicides and application techniques, see **Appendix A** (page 53). Woodmoor has also found that once the scrub oak is initially removed any regrowth can be dealt with during normal yard maintenance with a lawnmower. This does require that the regrowth be addressed while it is still very young.

Past Fuels Reduction Work

The *Forest Stewardship Plan*¹⁵ prepared for WIA in 1995 by Denise Larson, alerted the WIA Board to the severe wildfire hazards on 60% of its land. Like many other forested areas in Colorado, control of periodic natural wildfires that would naturally thin the pine forests and remove ladder fuels, has created a dense and unhealthy forest in Woodmoor.

In response to this report, the WIA began a program to educate homeowners on the need to reduce the fuels around their houses and banned wooden roofs. It applied for and received four Western States Wildland Urban Interface Grants to help owners reduce the fuels around their homes. In order to get maximum participation, owners received 50% cost-shares on their first \$1,000 of expenses (\$500 maximum). To date, 336 owners have received cost-shares since 2001. Table 5 (below) shows how this money was used.

Table 5. Fuel reduction work done in Woodmoor with help of cost-share grants.

	2001	2002	2003	2004-5
Resident Projects	86	127	72	51
Common Areas Treated	6	2	8	6
Total Cost of Work	\$122,017	\$145,774	\$103,943	\$111,635
Grant Money Spent	\$45,300	\$52,635	\$60,000	\$45,000

The 2004-5 grant provided cost-shares to 51 homeowners. WIA used \$21,879 to thin 20 acres of dense forest in 6 common areas (see locations in **Figure 7**, page 25). This thinning reduced the

¹⁵ *Woodmoor Community Landowner Forest Stewardship Plan*. 1995. Unpublished report by Denise E. Larson – Ecological Consultant; 1975 South Sherman, Denver, CO, 37 pages, 12 figures.

risks of wildfires spreading from the common areas to neighboring homes and vice versa. It also provided excellent demonstrations of Zone 2 defensible space thinning (trees spaced to 10-foot crown separations).

Woodmoor received the state's Forest Stewardship award in 2001. Jim and Marian Taylor, Directors of Forestry and Common Areas (1995 – 2002) received special recognition for their leadership.

The grant program has produced several surprises. The biggest one was that 15% of the residents who applied and completed their fuels reduction work did not seek cost reimbursement. Also, about 80% of the participants hired tree service companies to do the work. Some owners expressed reluctance to spend more than \$1,000 of their own money for fuels mitigation.

Woodmoor has continued the process of applying for grants and in the period between 2008 and 2017 received 5 additional grants. We had an additional 145 homeowners take part in those grants averaging 29 Homeowners a year with an average of \$23,959.84 reimbursed to our homeowners each year via these grants. We have confirmed that an additional 31 homeowners have done work on their properties without grants. Further we have had an additional 468 homeowners approach our Forestry team requesting Firewise evaluations or Defensible Space evaluations between 2008 and 2017. As previously stated we have also made it easier for our residents to perform Defensible Space creation and fuels mitigation by allowing them to perform work within 30 feet of their homes without needing to contact Woodmoor's Forestry team. One thing Woodmoor needs to improve upon is both following up with residents after evaluations have been done as well as keeping records of what has been done. This would allow us to better track our progress in the future.

Table 6. Current fuel reduction work done in Woodmoor with help of cost-sharing grants.

	2008	2010	2011	2013	2014
RESIDENT PROJECTS	32	30	11	39	33
Total Cost of Work	Unknown	Unknown	Unknown	69,701.35	22,923.62
GRANT MONEY SPENT	\$26,397.44	\$26,200.29	\$8,670.41	\$29,130.75	\$29,400.30

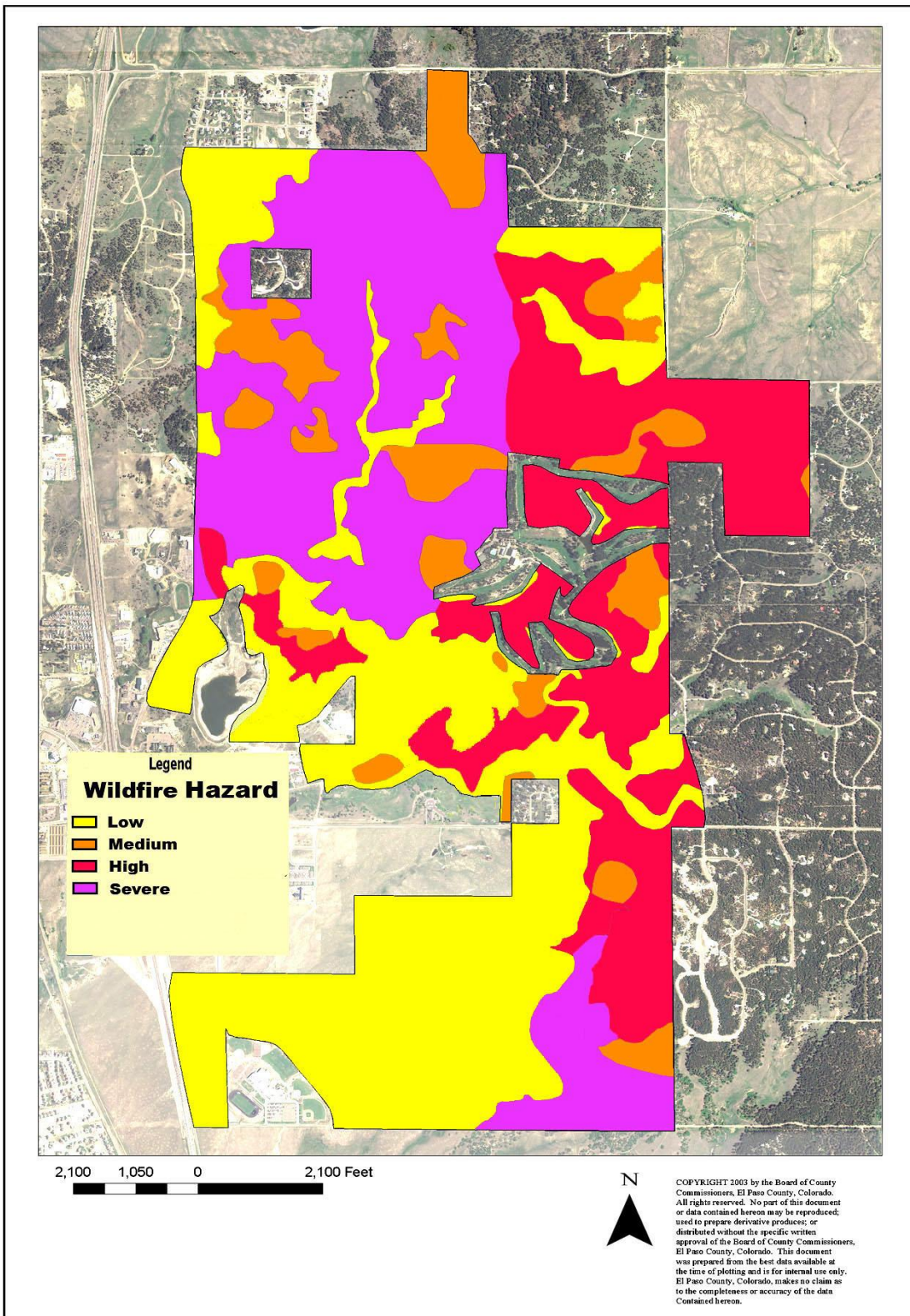


Figure 12 Map of Woodmoor's wildfire hazard classes based on vegetation types.

Evaluating Woodmoor's Wildfire Hazards

Initially Battalion Chief Bryan Jack (Tri-Lakes Monument Fire Authority) and Assistant District Forester Dave Root (Woodland Park District, Colorado State Forest Service) assigned wildfire hazard ratings to the vegetation types. Major consideration was given to: 1) risk of ignitions from lightning or other causes; 2) risk of low intensity surface fires becoming high intensity crown fires because of ladder fuels, 3) probability of wildfires becoming crown fires and igniting more than one home, and 4) identification of situations and/or specific neighborhoods that would be extremely dangerous to residents and firefighters if a wildfire started in these areas. As a part of this update process Dave Root (Woodland Park District, Colorado State Forest Service) was contacted and after time spent in the field he determined that these classifications are still valid for Woodmoor.

The definitions of Hazard classes that were based on vegetation types are:

Low Hazard – wetlands and grasslands; the risk of home ignitions from vegetation is low. Homes downwind of grass or forest fires are vulnerable to burning embers.

Medium Hazard – Ponderosa pine-low density and ponderosa pine-medium density; the risk of home ignitions from this vegetation is moderate; if a house were ignited, firefighters would be able to confine it to one structure. Homes downwind of wildfires are vulnerable to burning embers.

High Hazard – Gambel oak w/low density pine and ponderosa pine-medium density; there is a high probability of multiple home ignitions if a wildfire ignited the tops (crowns) of the trees in these vegetation types. All homes in this class are vulnerable to burning embers.

Severe Hazard – Gambel oak and ponderosa pine-high density with Gambel oak understory; a very high probability of multiple home ignitions of a surface fire spreading into the pine crowns because of the concentration of ladder fuels. These homes would be vulnerable to ignition from burning embers.

A wildfire hazard map based on these definitions is shown in **Figure 12** (page 38). The number of single-dwelling lots and acres in each hazard class are shown in **Table 7** (below). “Lot acres” estimate the area of lots and does not include area in roads and common areas.

Table 7. Total number of single-dwelling lots and lot acres by wildfire hazard classes

Hazard Class	Number of Lots		Lot Acres
Low	792	(30.2%)	414
Medium	260	(9.9%)	152
High	781	(29.7%)	409
Severe	794	(30.2%)	428
Totals	2,627	(100.0%)	1,392

Assuming each lot has a house, 794 (30.2%) Woodmoor homes are in a Severe Hazard forest type and 781 (29.7%) are in a High Hazard type. The actual numbers will be slightly less because not all lots have houses and small areas of lower hazard forest were included in these vegetation types.

Focusing Fuels Reduction In Management Units (MUs)

Two important objectives of a Community Wildfire Protection Plan are to identify fuels treatment priorities and to develop a strategic plan to reduce the risk of potential home ignitions in the most hazardous locations. To aid in this process, Woodmoor was divided into three Management Units based on geographic location. **Figure 13** (below), **Figure 15** (page 45), and **Figure 16** (page 47) with accompanying descriptions accomplish these goals.

North Woodmoor (MU 1).

The North Woodmoor Management Unit (see **Figure 13**) includes all of Woodmoor from County Line Rd. to Woodmoor Dr. and the lots in Kings Deer Point (east of Furrow Rd.). Non-Woodmoor developments in Woodmoor Heights, High Pines, Greenland Preserve, and Woodmoor Highlands are adjacent WIA's north boundary. The new Misty Acres development borders WIA on the west between Old Antlers Rd. south to Ridge View Circle. The "open" area north of Ridgeview Circle is not a part of Woodmoor. Palmer Ridge High School now sites on a 67 acre site west of Oakwood Circle and Woodmoor Dr.

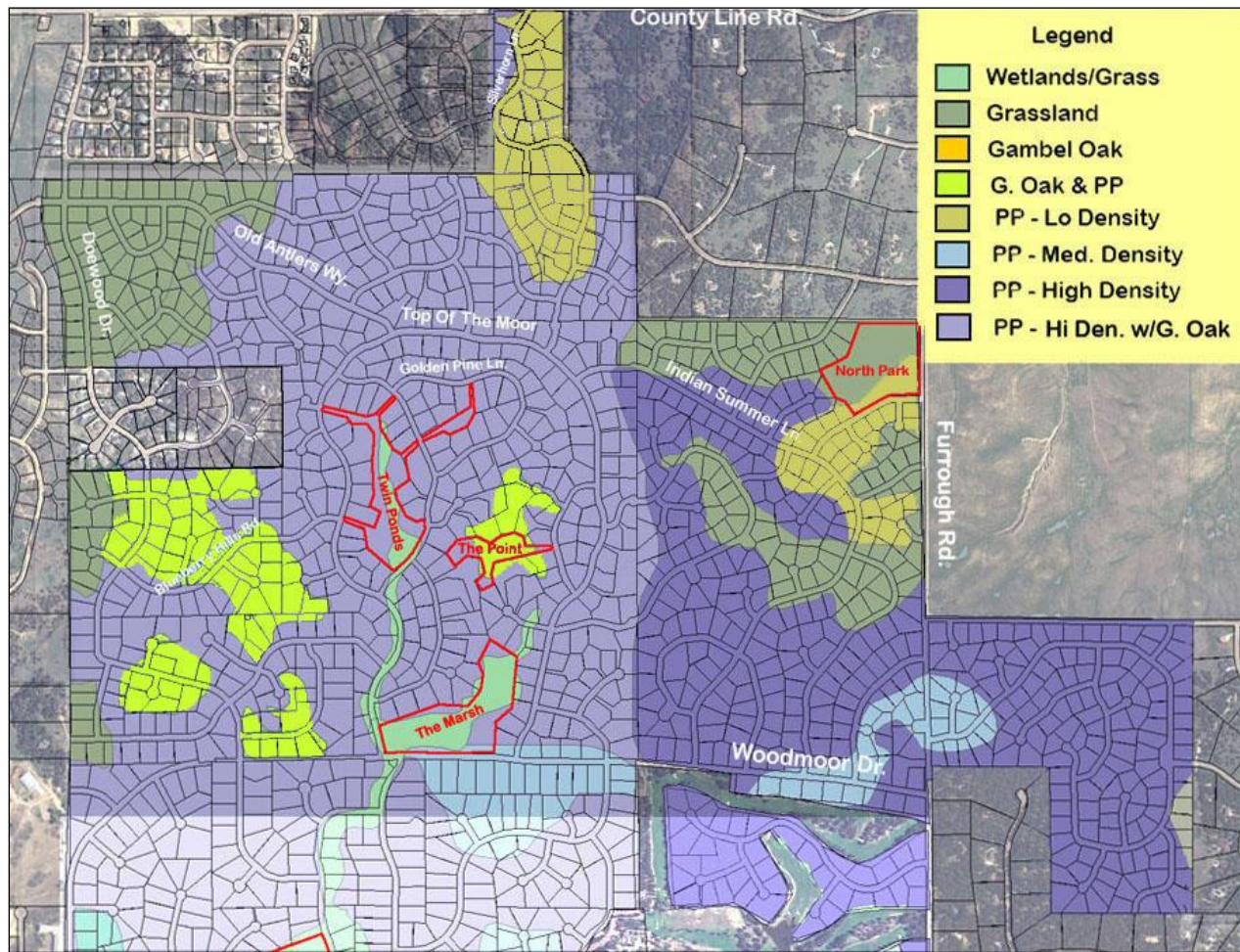


Figure 13 North Woodmoor Management (MU 1) showing vegetation types, single dwelling lots, main roads, and Common Areas (inside red lines).

Four common areas are located in this management unit. They are North Park, Twin Ponds, The Point, and The Marsh. Twin Ponds is the most heavily used common area in Woodmoor.

The number of single-dwelling lots and acres by Hazard Classes in MU 1 are shown in Table 7 (Page 39).

Table 8. Numbers of single-dwelling lots and lot acres by hazard classes in MU 1.

Hazard Class	Number of Lots		Lot Acres
Low	164	(15.0%)	134
(Grassland)			
Medium	91	(8.4%)	52
(PP – Low Density)			
(PP – Med. Density)			
High	369	(33.9%)	218
(G. Oak & PP)			
(PP – High Density)			
Severe	466	(42.8%)	261
(PP – Hi Den w/G. Oak)			
Totals	1,090	(100.0%)	665

MU 1 has the greatest need for thinning and annual maintenance to reduce ponderosa pine densities and High to Severe wildfire hazard conditions. Approximately 466 homes (42.8) are in vegetation types classified as severe hazard. They are in ponderosa pine forests which are prone to significant understories of Gambel oak or pine regeneration. Forty-eight of the lots near Blueberry Hills Rd. are in the Gambel oak-Low Density Pine type. If a fire started in either of these vegetation types it could easily become a crown fire that would be difficult to control before destroying many homes.

A third of the North Woodmoor MU is forested with high density ponderosa pine without significant ladder fuels. If a crown fire started in a forest of high-density pine with Gambel oak, it could easily spread to homes in this high hazard type. Homes downwind of a fire would be vulnerable to burning embers. The Marsh, Twin Ponds, and The Point Common Areas provide natural fuel breaks for wildfires that would move from west to east.

The worst-case scenario for MU 1 is for a lightning strike to ignite a fire in a grass or Gambel oak-pine type near the western edge of Woodmoor. A moderate to strong wind blowing from the south, southwest, or west could easily push flames into the treetops and become a crown fire. Once a crown fire began, there are no major fuels breaks to stop the fire and control would be difficult to achieve until it reached the Twin Ponds Common Area. It is likely that burning embers would blow over the Twin Ponds area and ignite grass and Gambel oak on the other side. From there, the fire could spread through the tree crowns until it reached Indian Summer Lane.

It is important to remember that crown fires almost always destroy more than one home. Topography and dense unbroken fuels around Blueberry Hills and Top Of The Moor Roads (East and West) would make control very difficult and be very hazardous for firefighters and their equipment.

Severe Hazard Neighborhoods. Some of the most severe hazard neighborhoods in North Woodmoor are:

Blueberry Hills Rd. - #1300 to #1470
Top Of The Moor West - #19700 to #19930

Lofty Pine Lane – all houses
 Golden Pine Lane – all houses
 Hidden Springs Glen - #19835 to #19990

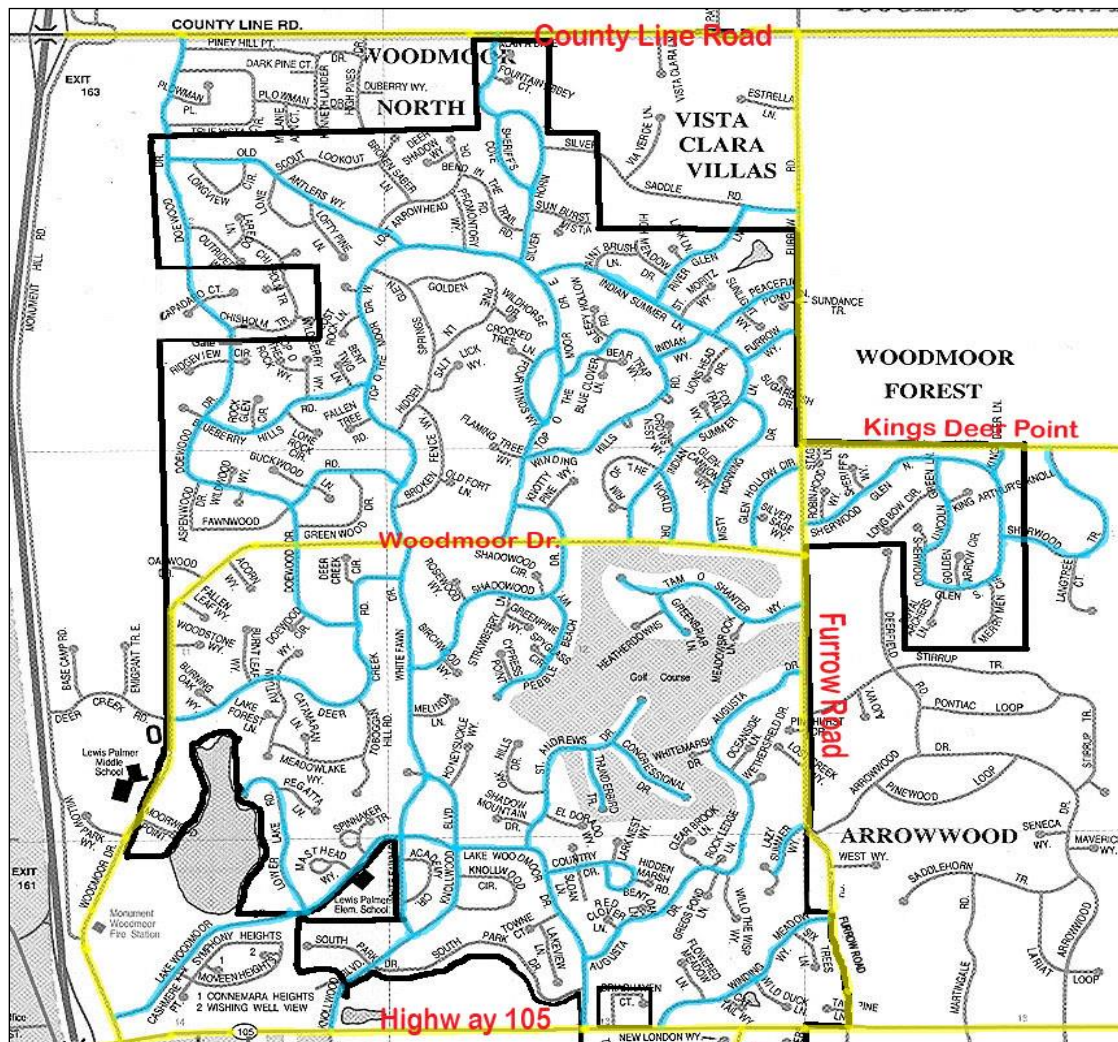


Figure 14 Map of North and Central Woodmoor’s emergency egress routes. “Blue” roads are the main evacuation roads to the “yellow” secondary roads going out of Woodmoor.

Emergency Evacuation Routes. The emergency egress options for owners living in North and Central Woodmoor are shown in **Figure 14 (page 43)**. If a wildfire started in north Woodmoor between Woodmoor Drive Top of The Moor West and Indian Summer Lane, residents could egress south to Woodmoor Dr. or northward via Top of The Moor to Old Antlers Way or Silver Horn Lane.

If a fire occurred between Woodmoor Drive, Doewood Dr., and Top Of the Moor Drive West, the only viable egress routes for visitors and residents would be south to Woodmoor Dr.

Recommendations. The fuels reduction strategy for North Woodmoor should focus on:

1. Maintaining of fuel breaks in High and Severe Hazard neighborhoods.
2. Helping owners in the most severe hazard neighborhoods make significant fuels reductions on a neighborhood basis.
3. Encouraging homeowners in Medium to Severe Hazard locations create and maintain defensible space around their homes.
4. Stress to all residents the importance of maintaining the work they have done by encouraging our residents to get annual lot evaluations. Annual evaluations will allow our residents to address any regrowth, particularly of Scrub Oak and young Ponderosa pine.

The highest priorities for fuels reduction and public safety projects should be:

Create 60-foot wide fuel breaks along sections of major streets that have dense pine forest on both sides. All ladder fuels should be removed and the pine thinned to Zone 2 defensible space guidelines of 10-foot average crown separation. Candidate streets include: Top Of The Moor West from Blueberry Hills Rd. north to Old Antlers Way, Top Of The Moor East from Flaming Tree Way north to Indian Summer Lane, and Woodmoor Dr. from Fallen Leaf Way east to Doewood Drive.

Maintain the effectiveness of Twin Ponds Common Area as a natural fire break by annual evaluation and thinning of pine trees on the west edges as necessary along with the elimination of ladder fuels in the understory.

Focus future Federal and State cost-share grants on helping owners in Severe and High Hazard neighborhoods apply Defensible Space recommendations to their properties.

CENTRAL WOODMOOR (MU 2).

Central Woodmoor has some of the most diverse vegetation situations in Woodmoor (see **Figure 15** (page 45) and **Table 9**, (page 46)). The first homes built in Woodmoor were located in the area nearest Lake Woodmoor. The average lot sizes are 0.25 acres and these owners enjoy almost 41 acres of common area and/or green space around groupings of houses. The main common areas are: Hidden Pond, Toboggan Hill, and Piney Trail/Lake Woodmoor.

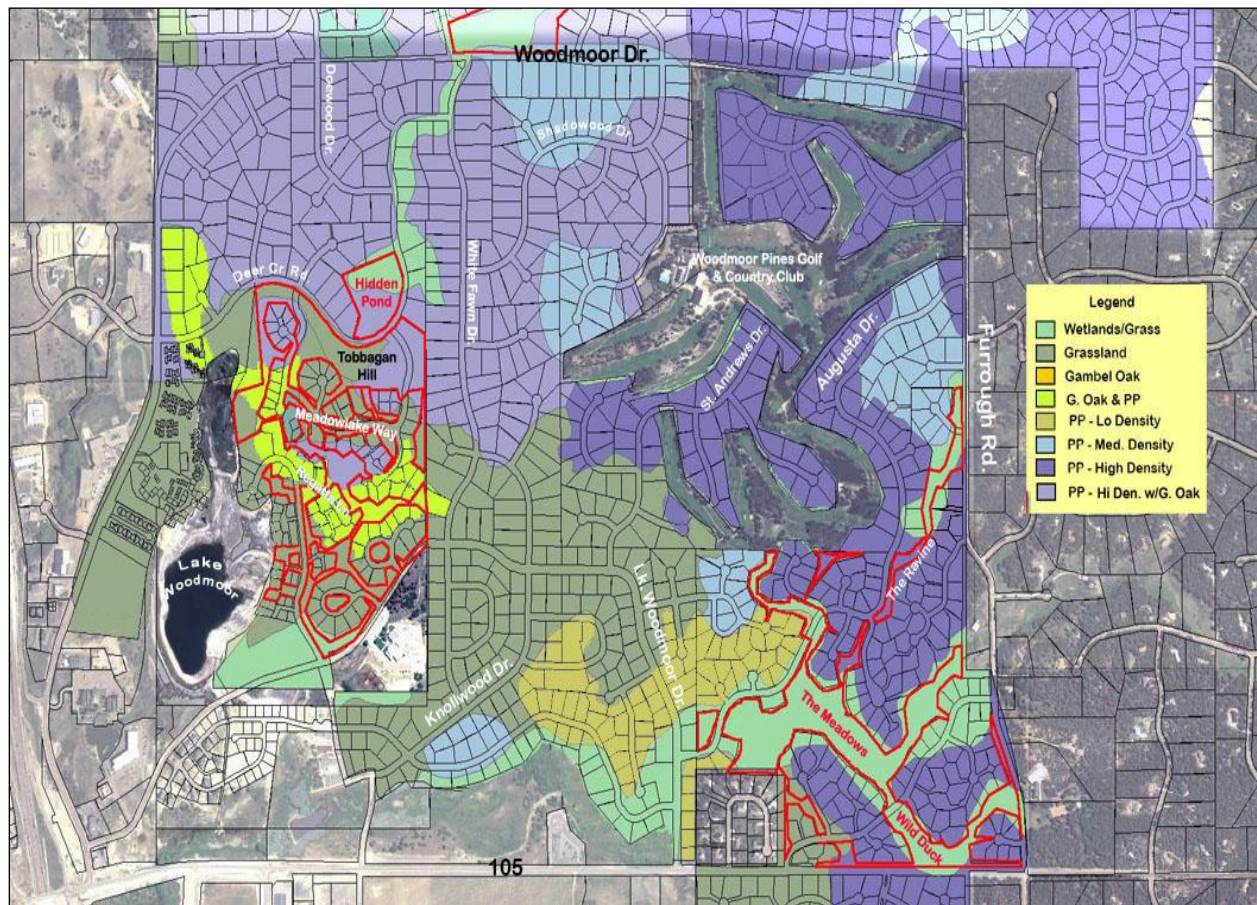


Figure 15 Central Woodmoor Management Unit (MU 2) showing Vegetation Types, single dwelling lots, main roads, and Common Areas (inside red lines).

Table 9. Numbers of single-dwelling lots and lot acres by hazard classes in MU 2.

Hazard Class	Number of Lots		Lot Acres
Low	341	(34.4%)	140
(Wetlands)			
(Grassland)			
Medium	159	(16.1%)	87
(PP – Low Density)			
(PP – Med. Density)			
High	268	(27.1%)	121
(G. Oak & PP)			
(PP – High Density)			
Severe	222	(22.4%)	109
(PP – Hi Den w/G. Oak)			
Totals	990	(100.0%)	446

Another important feature of MU 2 is the break-up of dense Ponderosa Pine vegetation around the Country Club at Woodmoor golf course and The Meadows, Playground, Ravine, and Hidden Duck Pond Common Areas. Although most of this vegetation is high-density ponderosa pine, the width, orientation, and location of the greens and common areas have effectively reduced the wildfire hazard for the houses closest to them. Although it would be difficult for a fire to become a sustainable crown fire, these homes would be vulnerable to ignition by burning embers.

Thirty percent of the Central Woodmoor homes are located in Grasslands or Wetlands. The Severe Hazard forest types where most of the 222 lots (22.4%) are located in a continuation of the dense ponderosa pine with Gambel oak forest on the north side of Woodmoor Drive. The wetlands along Deer Creek Way through Hidden Pond and Toboggan Hill Common Areas have created natural firebreaks.

A worst case wildfire scenario for MU 2 is that a fire would start in the Gambel oak understory north of Deer Creek Rd. and become a crown fire that would leap across Woodmoor Dr. and/or White Fawn Drive. Fortunately there are a few natural breaks in the pine canopy that could slow down the fire or cause it to drop to the ground. Burning embers could ignite structures downwind of the fire.

Severe Hazard Neighborhoods. Some of the most severe hazard neighborhoods in Central Woodmoor are:

Doewood Dr. #19065 - #19220
Woodmoor Dr. #1465 - #1845

Emergency Evacuation Routes. Residents of Central Woodmoor have the most choices for evacuation routes in case of a wildfire (see **Figure 15**, page 45). Except for a few dead-end cul-de-sacs, the danger to residents is the lowest of all MUs. The main exit roads out of the highest hazard areas are White Fawn Dr., Deer Creek Rd., Augusta Dr., and Woodmoor Dr.

Recommendations. The fuels reduction strategy for Central Woodmoor is similar to that of

North Woodmoor. It should focus on:

1. Maintaining fuel breaks in High and Severe Hazard neighborhoods.
2. Helping owners in the most Severe and High hazard neighborhoods make significant fuels reductions on a neighborhood basis.
3. Encouraging homeowners in Medium to Severe Hazard locations create and maintain defensible space around their homes.
4. Stress to all residents the importance of maintaining the work they have done by encouraging our residents to get annual lot evaluations. Annual evaluations will allow our residents to address any regrowth, particularly of Scrub Oak and young Ponderosa pine.

The highest priorities for fuels reduction projects should be:

1. Create 60-foot wide fuel breaks along sections of major streets that have dense pine forest on both sides such as White Fawn Dr. and Doewood Dr. All ladder fuels should be removed and the pine thinned to Zone 2 defensible space of 10-foot average crown separation.
2. Focus future Federal and State cost-share grants on helping owners in Severe, High and Medium Hazard neighborhoods apply Defensible Space guidelines to their properties.

SOUTH WOODMOOR (MU 3)

Management Unit 3 (South Woodmoor) is separated from Central Woodmoor (MU 2) by Highway 105 (see **Figure 16**, page 47). **Table 10 (Page 48)** lists the number of lots by hazard classes.

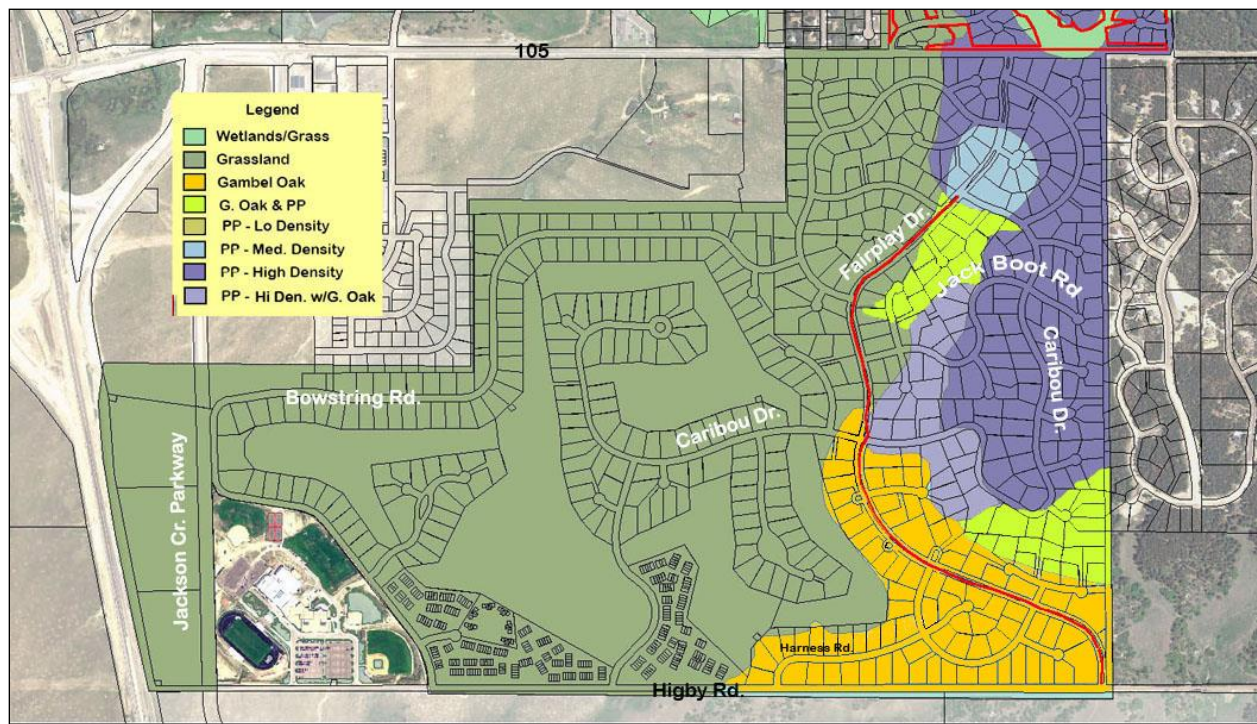


Figure 16. South Woodmoor Management Unit (MU 3) showing Vegetation Types, single and multiple dwelling lots, main roads, and Common Area (Fairplay Median).

Table 10. Numbers of single-dwelling lots and lot acres by hazard classes in MU 3.

Hazard Class	Number of Lots		Lot Acres
Low	287	(52.5%)	141
(Grassland)			
Medium	10	(1.8%)	13
(PP – Low Density)			
(PP – Med. Density)			
High	144	(26.3%)	70
(G. Oak & PP)			
(PP – High Density)			
Severe	106	(19.4%)	58
(Gambel Oak)			
(PP – High Den w/G. Oak)			
Totals	547	(100.0%)	282

South Woodmoor has 547 single dwelling lots plus 329 townhouses or condominiums on approximately 610 acres. The non-platted land in **Figure 16** belongs to the Walters Family Trust. At this time the land is still unused but there is the possibility that it will be sold and developed into additional single family housing. The 5-acre median strip on Fairplay Drive is the only common area in this unit.

Approximately 52.5% of the lots in South Woodmoor are located in the grassland vegetation type that is classified as Low Hazard. It would not be very difficult for a wildfire to start in this vegetation and produce enough heat to ignite a home. Mowing and irrigating the grass within thirty feet of a structure during dry periods can lower this risk further.

The other 260 single dwelling lots have woody vegetation capable of igniting a structure. Of them, 250 are located in High and Severe Hazard classes. Most of these lots are on the east side of Fairplay Dr. The sixty-two lots of pure Gambel oak west of Fairplay Dr. and along Harness Rd. were judged to be Severe Hazard.

The 144 lots in High Hazard vegetation have almost a continuous dense pine canopy. If a wildfire were to become a crown fire in this area, it would be very difficult to stop and many houses would likely be destroyed.

A worst-case wildfire scenario for South Woodmoor is for a fire to start in dense Gambel oak west of Fairplay Dr. and be blown across the median by a strong, dry, south to southwest wind. The flames could easily ignite the Gambel oak in the median strip and spread to the pine-scrub oak type on the east side. The relatively steep slope and dense mixture of oak and pine there would feed the flames and spread quickly up the hill as a crown fire. High wind conditions could cause flames to reach homes west of Caribou Dr. within 30 to 45 minutes. Tri-Lakes Monument Fire Authority officials do not believe this type of fire could be stopped before many homes

would be destroyed. Given the potential for a rapid spread, this wildfire scenario poses a great threat to human safety.

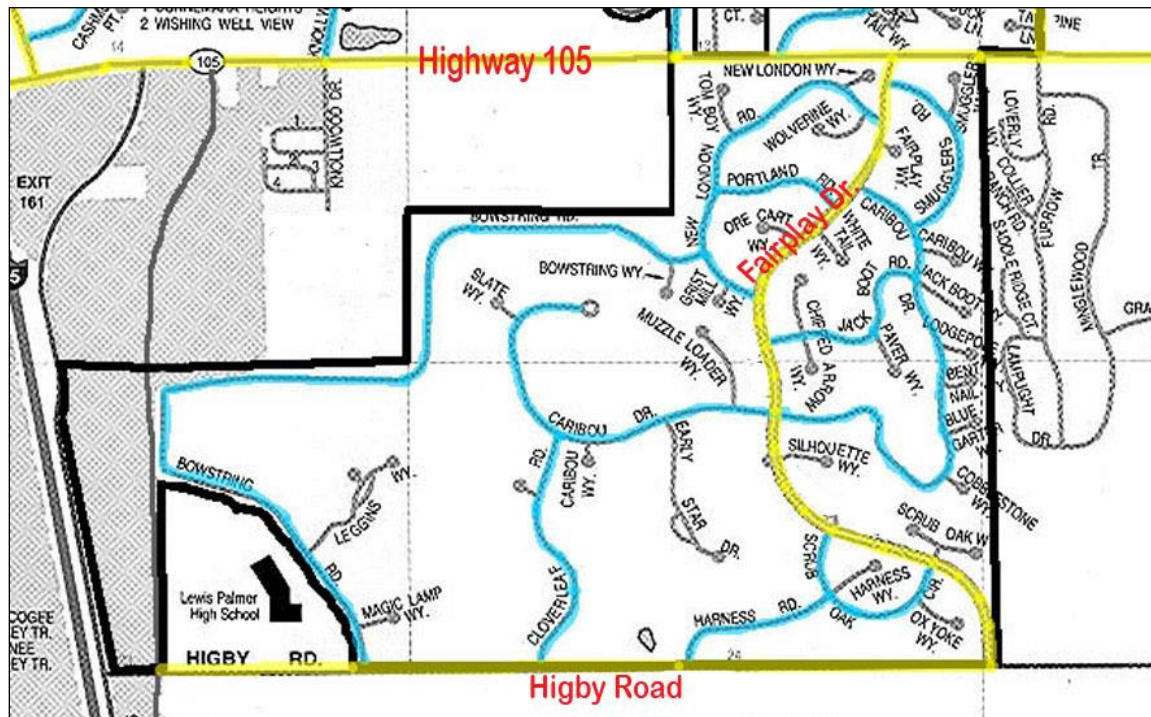


Figure 17 Map of South Woodmoor's emergency egress routes. "Blue" roads are the main evacuation roads to the "yellow" secondary roads going out of Woodmoor.

Some of the most severe hazard neighborhoods are:

- Harness Rd. – all houses
- Scrub Oak Circle – all houses
- Scrub Oak Way, #260 to #335
- Silhouette Way – all houses
- Caribou Dr., #17365 to #17450
- Jack Boot Dr. #325 to #470

Emergency Evacuation Routes. The emergency evacuation routes available to residents in South Woodmoor are shown in **Figure 17 (page 49)**. Fairplay Drive is the main north-south exit out of the forested area. Depending on the location of a fire, residents living east of Fairplay Dr. could use Caribou Dr., Jack Boot Rd., or Smugglers Rd. to reach Fairplay Dr. They would have the option of driving west on Bowstring Road, Caribou Drive, Cloverleaf Road, and Harness Road.

Recommendations. A fuels reduction strategy for this unit should focus on:

1. Maintain fuel breaks in High and Severe Hazard neighborhoods.

2. Helping owners in the most severe hazard neighborhoods make significant fuels reductions on a neighborhood basis.
3. Encouraging homeowners in Medium to Severe Hazard locations create and maintain defensible space around their homes.
4. Encourage homeowners in low hazard areas to remove the junipers close to their homes and replace them with a less flammable plant species.
5. Use future Federal and State cost-share grants to help owners in medium to Severe Hazard neighborhoods apply Defensible Space guidelines to their properties.
6. Stress to all residents the importance of maintaining the work they have done by encouraging our residents to get annual lot evaluations. Annual evaluations will allow our residents to address any regrowth, particularly of Scrub Oak and young Ponderosa pine.

Other Wildfire Protection Recommendations

Reverse 911 Notification System

Reverse 911 calls are not automatically routed to cellular phones. El Paso and Teller Counties maintain an Emergency Notification System to alert the public of emergency situations that are a threat to life or property. To be certain to receive notifications, residents' landlines, cell phones, text message, VOIP, TTY/TDD, and email addresses should be registered at: <http://member.everbridge.net/index/1772417038942752#/signup>; more information is provided at www.elpasoteller911.org. It is important to note that telephone lines that carry a solicitation blocker (where a caller has to enter their phone before the line will ring) may prevent emergency calls from being delivered (El Paso-Teller County Emergency Notification System 2016).

Importance of Maintaining Defensible Space

A reality of living in a Wildland Urban Interface community is that trees and shrubs continue to grow after thinning and pruning. "Touch up" defensible space thinning will be needed every 3 to 5 years on most lots. Gambel oak resprouting may require cutting and/or applying herbicides on cut stumps every 2 to 3 years.

Ideas For Improving Resident Participation

The key to success, or failure, in reducing fuels hazards and increasing community safety is in the hands of the homeowners. They are the ones that will benefit most from defensible space thinning and fuels reduction projects. Owners need to see the importance of fuels reduction and in thinning that improves the health of their forests

1. Increase Amount of Individual Grant Cost-Shares. Perhaps 30 to 40% of WIA owners are willing to reduce their forest fuels but unwilling to pay the high costs of doing it. Professional tree service companies charged an average of \$1,500 to \$3,000 per lot in 2006 for defensible space thinning. This included cutting pre-marked trees near houses, pruning branches to 8 feet, cutting Gambel oak, removing all slash, and cleaning up after the work was completed. Future grant cost-shares should be increased to generate greater participation.

2. Help Owners Dispose of Trees and Slash. Woodmoor currently sponsors 2 chipping days a

year for the residents so that they can dispose of trees and slash. Currently these chipping days are done at the Lewis Palmer Middle School.

3. Provide Classes On Defensible Space Thinning. Attendance in a class should continue to be a requirement for all owners participating in fuels reduction cost-sharing grants.



Sponsor Firewise Community Education Events.

As of 2017 Woodmoor is both a Firewise Community and a Ready Set Go Community.

The Firewise Community program is designed to involve homeowners and community leaders in efforts to protect people, property, and natural resources from the risk of wildland fire – before a fire starts. A consortium of representatives from federal and state wildland fire agencies and the National Fire Protection Association direct it. It provides information and training on ways to encourage residents to do fuels reduction work around their homes. It offers educational literature and videotapes that show homeowners how they can reduce wildfire risks through landscaping and ignition-resistant building materials.

In order to maintain our Firewise Communities status, WIA must:

1. Observe a Firewise Communities/USA Day each spring that is dedicated to a local Firewise project.
2. Invest a minimum of \$2.00 per capita annually in local Firewise projects (work by Tree Monitors qualifies);
3. Submit an annual report to Firewise Communities/USA that documents compliance with the program.

Currently Woodmoor hosts at least 2 chipping day events each year and may investigate the possibility of 3 such events in 2018 due to the high volume of participation in 2017.

Some other possible annual “Firewise Day” activities are:

9. Hold an annual debris removal day in cooperation with Tri-Lakes Monument Fire Protection District.
10. Create a fuel removal project that enlists local volunteers.
11. Host a Firewise event with Tri-Lakes Monument Fire Protection District where classes, literature, and other information are given.

A 10-YEAR PLAN TO REDUCE WILDFIRE FUELS IN WOODMOOR

Year 2017

1. Apply for all available fuels reduction grant money.
2. Perform annual maintenance on the Gambel oak in median of Fairplay Drive by July 1. This includes trimming the Gamble oak.
3. Recruit 30 to 40 homeowners in Severe Hazard neighborhoods to do Defensible Space thinning on their properties by December 31. If grant money is available, award it first to owners willing to do “cross boundary”¹⁶ work in Severe Hazard neighborhoods. Use grant money to create fuel breaks in strategically important neighborhoods.
4. Maintain the natural firebreaks in Twin Ponds and Hidden Pond Common Areas by annual evaluation of this area and performing any necessary thinning of the pine and shrubs to defensible space recommendations.
5. Organize and or participate in an annual Firewise education event in coordination with the Tri-Lakes Monument Fire Protection District and Colorado State Forest Service, or neighboring community.
6. Perform maintenance thinning and control of Gambel oak re-sprouting in The Marsh and Toboggan Hill Common Areas and all common areas as needed
7. Provide educational classes on defensible space, Firewise, and forest management practices.

Years 2018 to 2026

1. Apply for all available fuels reduction grant money.
2. Recruit 30 to 50 residents in Severe Hazard neighborhoods to do Defensible Space thinning on their properties by December 31. If grant money is available, award it to owners willing to do cross boundary work in Severe Hazard neighborhoods. Also, use grants to create fuel breaks in strategically important neighborhoods.
3. Organize, host or participate in a Firewise community event with the help of the Tri-Lakes Monument Fire Protection District and Colorado State Forest Service, or neighboring community.
4. Do maintenance thinning of the Ponderosa Pines and control of Gambel oak re-sprouting in common areas where needed.
5. Organize and sponsor at least 2 chipping day events to provide a way for our residents to perform the necessary annual maintenance of Gambel oak, Pine needles and Pine trees on their properties
6. Provide educational classes on defensible space, Firewise, and forest management practices.

¹⁶ “Cross boundary” refers to coordinated fuels reduction work between two or more owners of adjoining lots.

APPENDIX A. Control of Gambel Oak Re-sprouting With Herbicides Applied to Stumps

The application of a herbicide to cut stumps of Gambel oak has been shown to be effective in greatly reducing or eliminating the resprouting of Gambel oak after it is cut. It should be done after the leaves have fully formed and are exporting significant carbohydrates (photosynthate) to the root systems. This downward flow carries the herbicide to the roots and kills it. Herbicides applied to stumps of leafless plants are ineffective.

One of the approved herbicides below should be applied to the stumps' cut surface within 2 to 3 minutes after the oak is cut. If applied immediately, a herbicide/water solution is sufficient. If the treatment is delayed and the cut surface has begun to dry, a herbicide/basal oil mixture must be used and applied to the top and around the collar of the stump.

For stumps greater than 3 inches in diameter, thoroughly wet the outer edge while avoiding herbicide runoff. This is because the only living tissue in larger trees is around the outer edge. Covering the entire cut surface will require more herbicide, most of which will provide little effect. For smaller stems it is appropriate to cover the entire cut surface. Herbicides can be applied using a backpack sprayer, squirt bottle, or paintbrush. Regardless of how the herbicide is applied, a tracer dye should be included to ensure treatment of all individual stumps.

Recommended Herbicides

Active Ingredient (Brand Names)	Recommended Mixture
Imazapyr (Arsenal AC or Chopper)	6 oz/gal (for Arsenal AC or 8-16 oz/gal (for Chopper)
Triclopyr (Garlon 3A)	50% in water
Triclopyr (Remedy or Garlon)	25% solution in water or basal oil
Triclopyr + fluroxypyr (Pasturegard)	50% solution in water or basal oil
Glyphosate (several brands)	50-100%

Garlon 3A is excellent for applications to fresh stumps. If the surface of the stump has begun to dry prior to herbicide treatment, apply Chopper, Garlon 4, Remedy or Pasturegard in basal oil. Garlon 3A will not effectively mix with basal oils. Glyphosate is not effective on stumps that have started to dry after cutting. If immediate treatment is not possible, other herbicides should be selected since it should not be mixed with basal oils.

Note – home owners may personally apply these herbicides without a pesticide applicator's license. If they will be applied by a hired person, that person is required to have a license.

APPENDIX B. Control of Common Noxious weeds

1. Canada Thistle (*Cirsium arvense*).

Canada Thistle is a member of the Aster or Sunflower family. It is a perennial that reproduces by seeds and fleshy creeping roots that may go sideways 15" and down more than 15'. It has an erect hollow, smooth and slightly hairy stem, 1 to 5 feet tall and branched at the top. The leaves are dark green to grayish green, and crinkly, with a large center vein and set close to the stem of the plant. Sharp spines are numerous on the outer edges of the leaves and on the branches and main stem of the plant. The flower is a small bristly cluster, 3/8" to 5/8" in diameter. They are light pink to rose on a longish bulb and the seed forms a narrow paint-brush-type head until it opens. The seed is flat, dark brown, and approximately 1/8" long.

Canada thistle emerges in April or May in most parts of Colorado. Infestations can be found in areas such as cultivated fields, riparian areas, pastures, rangeland, forests, lawns, gardens, roadsides, and in waste areas. Control is difficult because of its vigorous growth, and extensive underground root system.

Management Recommendations. K. C. Beck¹⁷, Professor of Weed Science, Colorado State University, recommends stressing the plants to use up their store of energy. This is done by mowing at least 3 times at 2 week intervals so that it cannot produce seeds. Spray the emerging spring plants and those after first frost with Tordon 22K (picloram), Curtail (clopyralid plus 2,4-D), Transline (clopyralid), Banvel/Vanquish/Clarity (dicamba), or 2,4-D and Telar (chlorsulfuron).

3. Yellow Toadflax (*Linaria vulgaris*).

Yellow Toadflax is also known as "Butter-and-Eggs" and "wild snapdragon". It reproduces by seed and extensive horizontal roots. The stems are smooth, erect, leafy, often in clumps, and 1 to 2 1/2 feet tall. Numerous pale green leaves are alternate, narrow, pointed at both ends, and 2 1/2 or more inches long. Flowers resemble those of cultivated snapdragon; each has a spur extending below from the lower lip of the corolla.

Management Recommendations.¹⁸ This species is also very difficult to control. In Colorado, control from Tordon (a restricted herbicide) applied at time of flowering has given the most consistent control. The recommended rate is 4 pt/acre. Yellow toadflax usually recovers from single applications. Other studies in Colorado suggest that yellow toadflax control may be improved if Tordon is applied over three consecutive years, but control varied with location.

4. Diffuse (*Centaurea diffusa*) and Spotted Knapweeds (*Centaurea maculosa*).

Diffuse and Spotted Knapweeds are annual or short-lived perennials. Diffuse Knapweed spreads by seed while the Spotted can form shoots each year from a taproot. Spotted knapweed looks like diffuse knapweed with some notable exceptions. It has solitary lavender to purple flowers on shoot tips that are the same size as diffuse knapweed flowers. Diffuse Knapweed has many soli-

¹⁷ Beck, K.G. Canada Thistle. CSU Cooperative Extension Service, Fact Sheet 3.108.

¹⁸ Beck, K.G. Biology and Management of the Toadflaxes. CSU Cooperative Extension Fact Sheet 3.114.

tary flowering heads on shoot tips. The flowers are usually white but may be purplish.

Management Recommendations.¹⁹ Diffuse and spotted knapweed can be managed similarly. They are readily controlled with herbicides. However, they will reinvade unless cultural techniques are used. Research conducted at Colorado State University indicates that Tordon 22K (a restricted herbicide) and (picloram) at 1 to 2 pt/Acre, Transline (clopyralid) at 0.67 to 1 pt/Acre, Curtail (clopyralid + 2,4-D) at 4 to 6 pt/Acre, or Banvel/Vanquish/Clarity (dicamba) at 1 to 2 pt/Acre control diffuse knapweed. A spring herbicide treatment is most effective.

Herbicide treatments for hire must be done by a licensed herbicide applicator. For questions about pesticide licensing contact the Colorado Department of Agriculture at **303-239-4148** or <http://www.ag.state.co.us/DPI/PesticideApplicator/Home.html>.

Note – homeowners may personally apply “non-restricted use” herbicides without a pesticide applicator’s license. If they will be applied by a hired person, that person is required by federal and state laws to have a license. Tordon and other “restricted use” herbicides may only be purchased and applied by a person with a current pesticide applicator’s license from the state.

¹⁹ Beck, K.G. Diffuse and Spotted Knapweed. CSU Cooperative Extension Fact Sheet 3.110.

APPENDIX C. Control of Cattails

Cattails in modest amounts around a pond give it a very natural and beautiful appearance. They provide habitats for the Red-wing Blackbird and other birds. However, for Wild Duck, Lower Twin, and Hidden Ponds, they are interfering with the ponds usage and appearance.

Cattails have two means of reproduction. One is the tail itself that spreads seeds that are airborne. The second is sending rhizomes from its large tuber root to form new plants nearby. The Cattails large tuber is the major reason this plant is hard to control. The tuber can be twice the size of a potato and makes pulling the cattail out by the roots almost impossible.

There are three methods of controlling Cattails: chemical, mechanical, and drowning. The only practical mechanical method is the use of a back-hoe capable of reaching out and removing the cattail and its root system. This was the method used in 2001 on Wild Duck and Upper Twin Ponds and it clearly was not successful.

The drowning method requires cutting the Cattails off 2-3 inches under the water line. This disrupts the oxygen to the root system and causes the plants to drown. This method is only effective if the water level does not drop below the level of the cuts.

Chemical control is the most commonly used method. It can be done in any situation without damage to the landscape, aquatic organisms, or humans. The EPA approved chemicals are systemic herbicides that work from the point of contact, into the vascular system and into the roots. Good contact with the leaves is essential. A nonionic surfactant is mixed with the herbicide to break down the waxy coating on the leaves and provide better penetration.

Best results are achieved during the summer or fall months when the vascular flow is downward into the rhizome. It should be applied by spray when the plants are actively growing and beyond the early-to-full bloom stage of growth. Visible effects usually occur within 2-7 days. The dead stems of the cattails should be removed to improve the ponds' appearance and keep them from contributing to the eutrophication of the ponds.

The most frequently recommended herbicide for Cattails is "Rodeo" (glyphosate). When applied according to the directions on the label, it is 95% effective and will not harm any non-target plants. It is very important that all plants have contact with the spray. Missed or surviving plants can be sprayed again to get almost complete control.

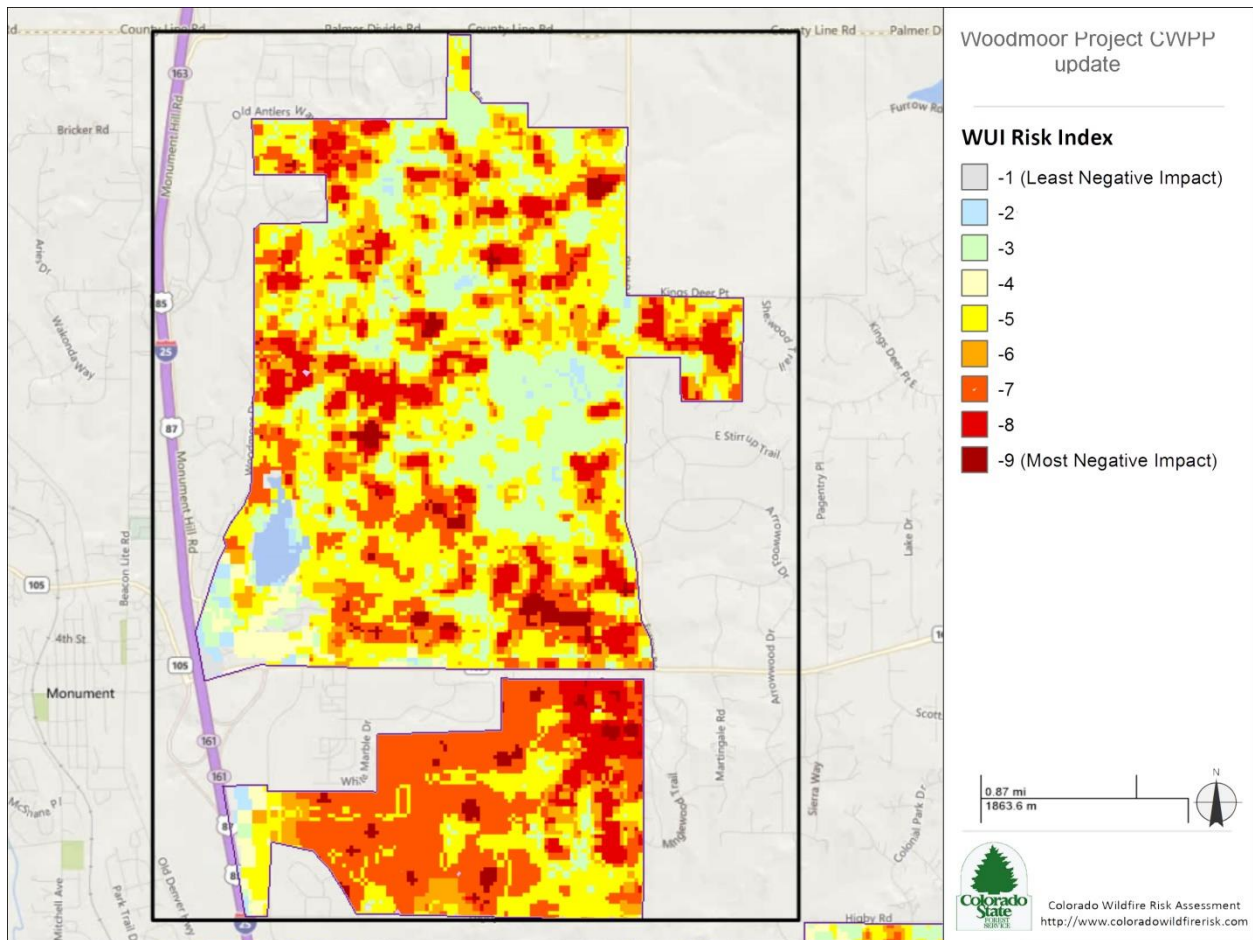
Note – homeowners may personally apply "non-restricted" herbicides without a pesticide applicator's license. If they will be applied by a hired person, that person is required to have a license.

APPENDIX D. Maps

1) Satellite Map of Woodmoor:



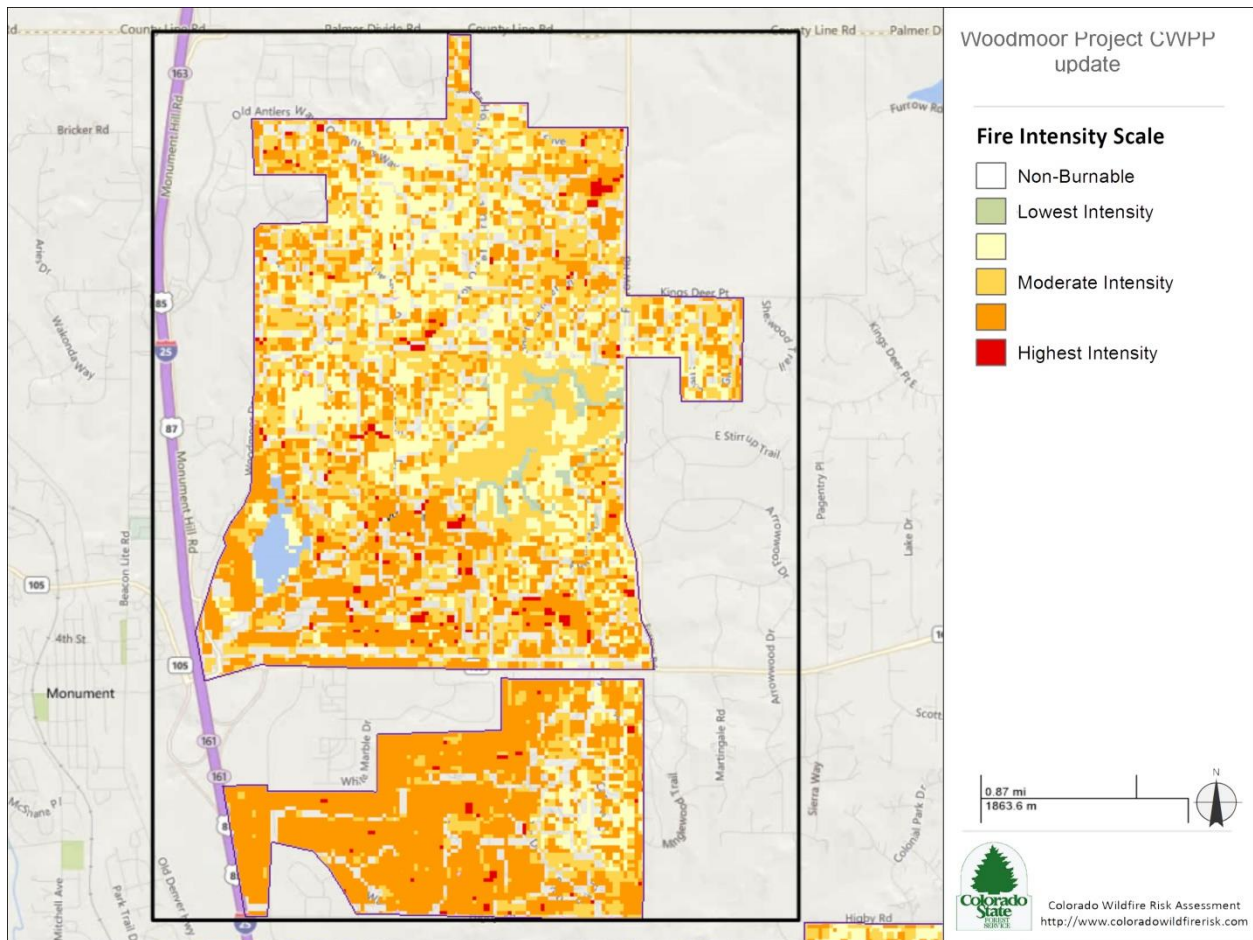
2) WUI (From CO-WRAP Fire Risk) MAP



The Colorado wildfire Risk Assessment Portal (CO-WRAP) is a GIS based program that allows comparison of wildfire risks across the state. The program compares relative risks from one area to another, but it is not a predictor of actual fire behavior on any given day since CO-WRAP outputs are based on long term average weather conditions. Actual fire behavior is largely influenced by the weather conditions on the day of the fire.

Wildland Urban Interface fire risk combines outputs based on the three determinants of fire behavior, fuel, topography and (long term average) weather with population density. CO-WRAP predicts losses to property and the environment would be severe in Woodmoor.

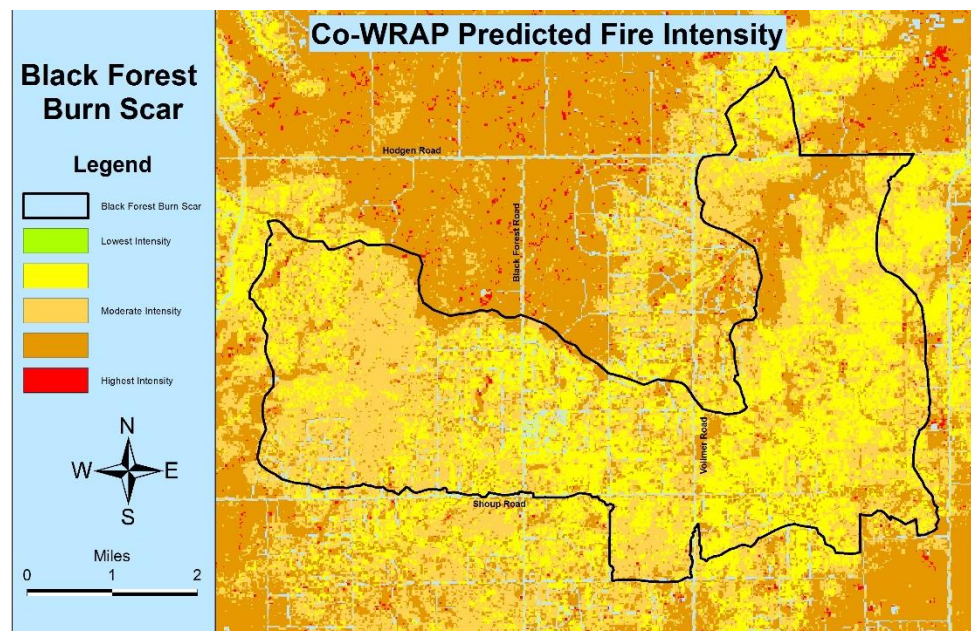
3) Fire Intensity Scale Map (From CO-WRAP)



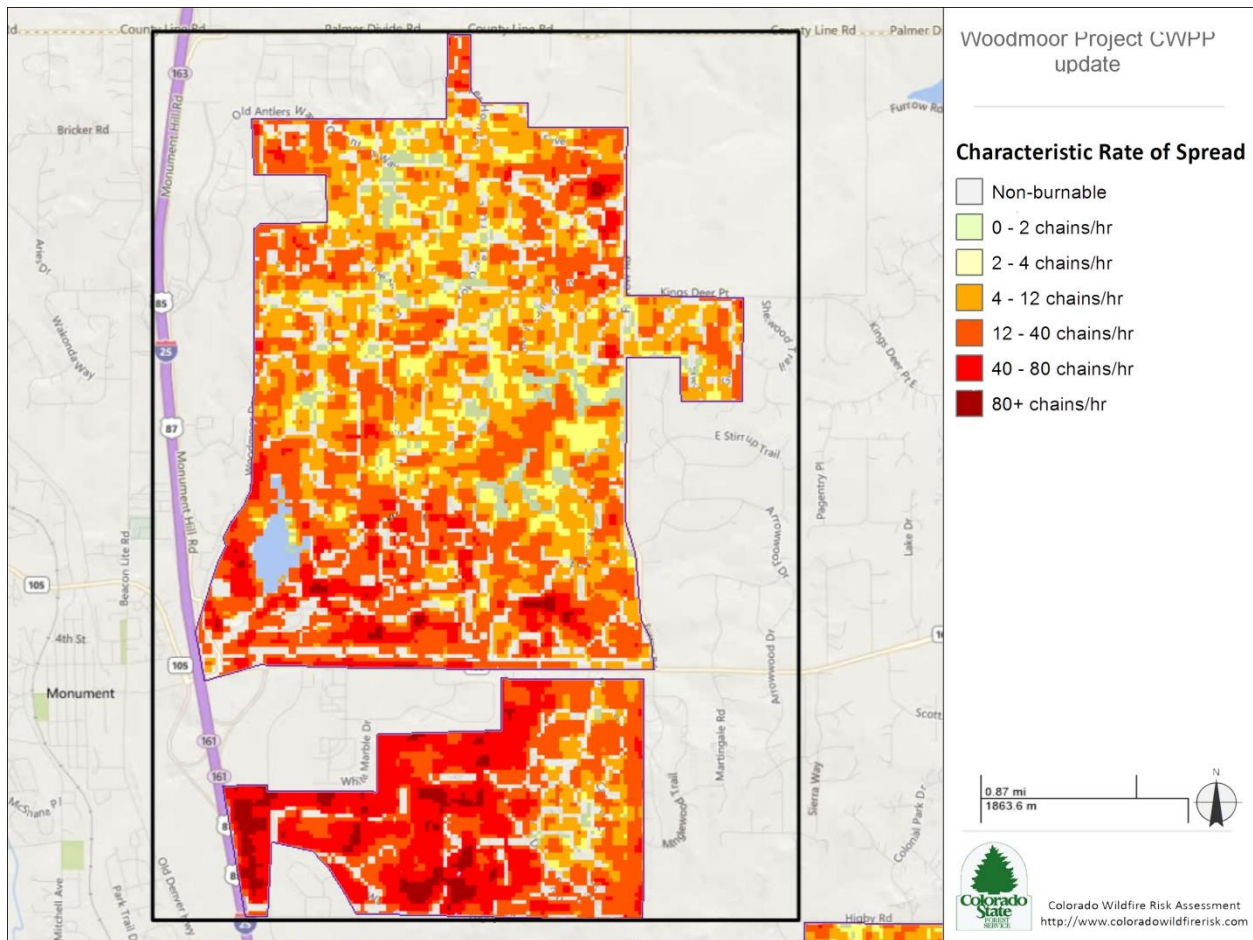
CO-WRAP combines the three elements of fuels to topography and long term average weather to compare potential fire intensity. Woodmoor is a moderate to high risk compared to other areas on the landscape.

Readers must understand that the terms lowest, moderate and highest are comparative term not absolute

indicators of fire behavior. Comparing the Woodmoor output to the CO-WRAP prediction for the Black Forest Fire (shown at the right) gives an indication of the absolute hazard in Woodmoor.

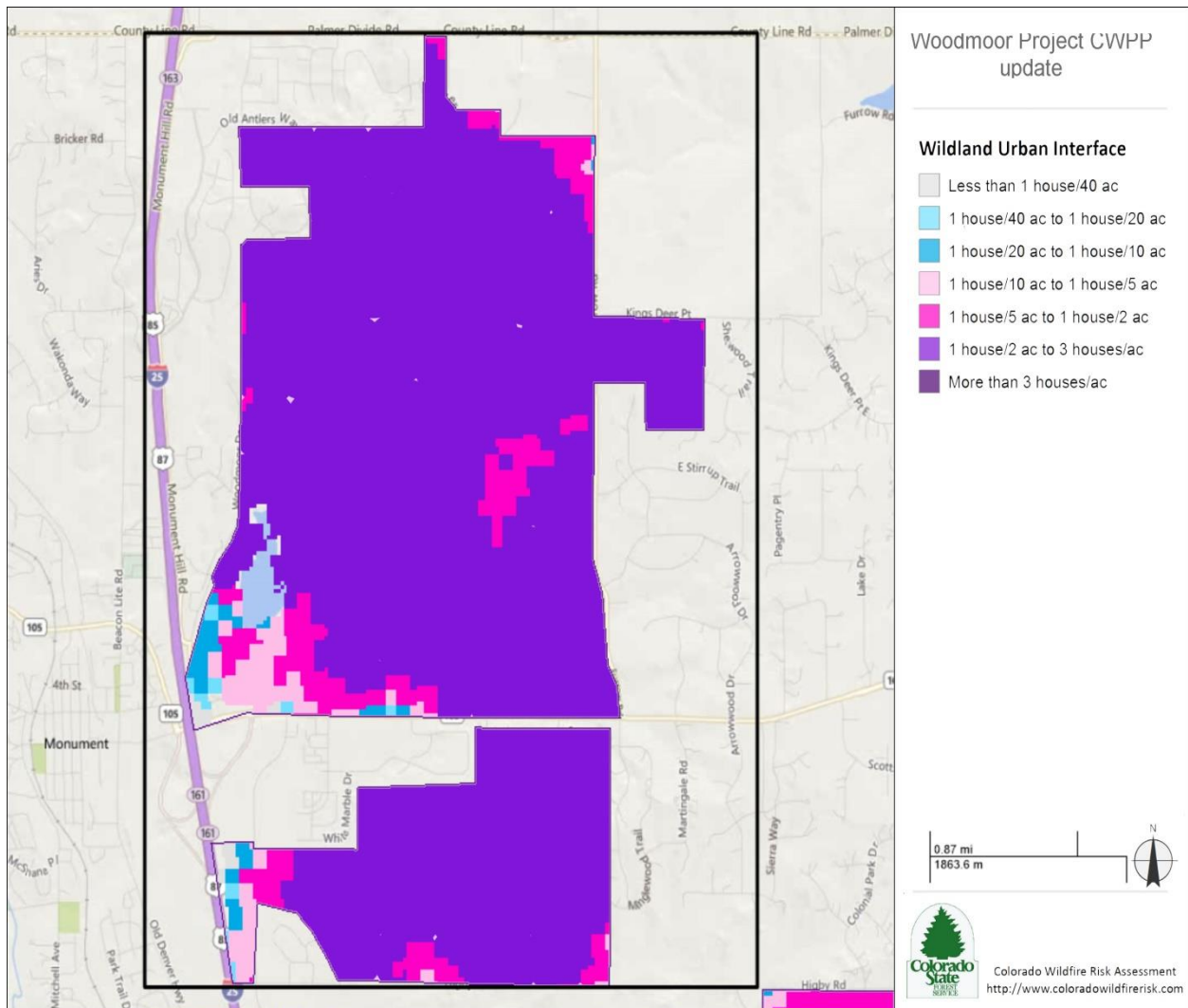


4) Rate Of Spread Map (from CO-WRAP)



Rate of spread indicates how fast a fire will spread over the landscape. CO-WRAP output uses the common, and confusing, practice among firefighters of predicting fire spread in chains per hour. A chain is 66 feet. A fire spread rate of 40 chains per hour equals 2,640 per hour or about one-half mile per hour.

5) Population Density Map (from CO-WRAP)



Housing density in Woodmoor averages about three houses per acre, just lightly less than most high density subdivisions in urban areas. At this density, homes are at risk from the wildland fuels, but also from home to home ignitions.

APPENDIX E. Forms used by Forestry volunteers for Firewise evaluations

1) FireWise Home and Lot Evaluation Form



Woodranger



FIREWISE HOME & LOT EVALUATION

Name _____
Address _____ Lot # _____
Phones: Home _____ Cell _____
Email Address _____ Lot-Acres _____

Administrative Use

Request: _____
Completed: _____
CWPP Hazard Rating: _____

Evaluating Risks & Mitigation Preventing Burning Embers Igniting Your House

- ___ 1. **Wood Roof**; Replace with fire-resistant shingles.
- ___ 2. **Skylights**; Replace plastic with types constructed with tempered glass.
- ___ 3. **Rain Gutters**; Keep gutters free of plant debris during fire season.
- ___ 4. **Roof Debris**; Routinely remove needles, leaves, and branches from roof.
- ___ 5. **Wood siding**; Fill gaps & holes in siding & trim materials with caulk.
- ___ 6. **Deck Boards**; Replace boards that are less than one inch thick or are in poor condition. Use metal flashing between the deck and house.
- ___ 7. **Under Deck & Wood Steps**; Remove all plant debris, wood piles & scraps and other easily ignited materials.
- ___ 8. **Deck Furniture**; Place combustible furniture inside house or garage if a wildfire is threatening.
- ___ 9. **Junipers & other resinous evergreen shrubs**; Remove all within 8 feet of house.
- ___ 10. **Needles, leaves, and dead grass under landscape plants**; Clean out twice yearly to prevent accumulation.
- ___ 11. **Flammable Mulch**; Replace all wood mulches within 5 feet of house with non-combustible types.
- ___ 12. **Flowerboxes Under Windows Or On Deck**; Replace wood mulches with noncombustible type; clean out debris and dead plants.
- ___ 13. **Window Wells**; clean out all needles, leaves, & debris before each fire season.
- ___ 14. **Woodpiles**; Move firewood stacks & scrap lumber piles at least 30 feet from house.
- ___ 15. **Wooden Fence Connected To House**; Create a noncombustible fence section or gate attached to the house or at least 5 feet away.
- ___ 16. **Wood Lattice Enclosing Deck**; Remove & replace with 1/8 inch wire mesh.
- ___ 17. **Other** (specify): _____

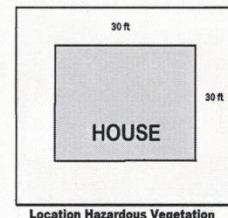
Your greatest risks from embers are (Item numbers): _____

Zone 1 – Mitigating Risks Of Ignition From Burning Trees Within 30 Feet of Home

Forest Vegetation

- ___ 1. Highly flammable trees & shrubs grow too close to house, deck, & wooden stairs. **Mitigation**: Remove all pine & other conifers within 15+ feet of house, wood decks, stairs, and ancillary buildings. If one or more trees are retained, they become part of the house "foot print" and the 15 feet starts from their outer branch tips of these trees.
- ___ 2. Branches of pine or other evergreen trees are within 10 feet of bottom of roof. **Mitigation**: Prune live branches on these conifers to a height above roofline.
- ___ 3. Contiguous groups of pine or conifer trees and/or brush provide fuel that can bring flames and heat to house. **Mitigation**: Break up contiguous tree links by thinning to average 10-foot tree crown separation. Remove all saplings and scrub oak growing under uncut pine.
- ___ 4. Scrub oak grows within 15 to 20 feet of house. **Mitigation**: Remove all scrub oak within 30 feet. A few large oak may be left if lowest branches are pruned up 50% of height.

Your **ZONE 1 RISK RATING** is _____. Your greatest risks from burning trees are:



Recommendations that lower risk:

Recommended number of conifer trees to cut (all sizes): ____ Trees to prune: ____.

See diagram for location of brush to be removed.

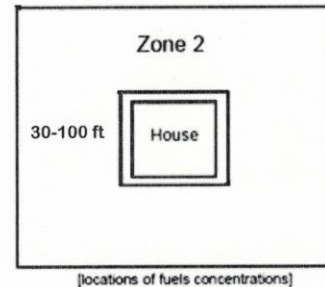
2) Zone 2 – Mitigating Risks Of a High Intensity Forest Fire Burning within 30 to 100 Feet of House

Last Name _____

Zone 2 – Mitigating Risks Of A High Intensity Forest Fire Burning Within 30 to 100 Feet of House

Forest Vegetation

- 1. Relatively dense pine forest; many small weak trees; occasional small openings; possible signs of previous unsuccessful bark beetle attacks. Possible dwarf mistletoe infections. **Mitigation:** Thin pines to a density of 10 feet average "crown separation" (measured from outer tips of branches). Remove weakest trees first.
- 2. Relatively dense pine forest with **understory** of Gambel (scrub) oak or pine saplings and seedlings. **Mitigation:** Thin pine to 10-foot crown separation and remove all scrub oak and pine saplings from under the pine trees.
- 3. Primarily large dense clumps of Gambel (scrub) oak; **Mitigation:** Break up large clumps into smaller ones. The open space between clumps should equal 2X height of the oak. May leave large diameter oak if branches are pruned up 50% of total height. Remove all dead branches.
- 4. Mixture of variable size clumps of Gambel (scrub) oak, scattered pine, and openings. **Mitigation:** Break up clumps of oak into smaller ones and remove all dead branches. If possible, prune lower branches to 50% of total height. Thin pine clumps to favor the dominant and healthiest trees.



Your ZONE 2 RISK RATING is _____. Your greatest risks from a crown fire are: _____

Recommendations that lower risk: _____

Recommended number of pine & conifer trees to cut (all sizes): _____

See diagram for location of brush to be removed.

Other Comments: _____

Pine Trees Cutting Permit*

1- Mountain Pine Beetle Trees:

- Found and marked ____ pine trees infested with live Mt Pine Beetles. They must be disposed of by: ____/____/____.

2- FireWise Mitigation Trees To Be Cut (all sizes):

- Zone 1 - number of marked pine - ____; number of unmarked pine - ____.
- Zone 2 - number of marked pine - ____; number of unmarked pine - ____.

Approval to cut marked & unmarked pine trees beyond 30 feet from house by: ____/____/____ or in ____ days.

FireWise Advisor Signature _____ Date ____/____/____

Verification – completed tree cutting & mitigation: FW Advisor Signature _____ Date: ____/____/____

** Note: Woodmoor rules and policy require written permits to cut ponderosa pine larger than 4.0 inches at chest height if growing more than 30 feet away from a house or 5 feet from driveways. The purpose is to prevent removal of all pine trees on a lot. All other tree species may be cut without a permit. Call the WIA office at (719) 488-2693 to request permits.*

For More information on mitigation visit the FireWise page on the WIA website: www.woodmoor.org

Disclaimer: WIA and its FireWise Advisors have absolutely no liability for this report or from any conversation or communications. This advisory report is for WIA member/owners only and shall not be distributed. WIA shall recover its attorney's fees and costs to enforce and defend the report. The recipient's acceptance of this report constitutes agreement with the terms hereof.

Copies: White/Original – WIA Office, Yellow – Homeowner, Pink – FireWise Advisor

Revised 6/10/14