FOREST AGRICULTURE and STEWARDSHIP INCENTIVES PLAN

SUNSHINE FOREST

JEANETTA SCHMIDT
Box 1204
Laramie, WY 82070

Parts of the
S1/2 NE1/4, Sec 22, T1N, R71W, S.P.M.,
N1/2 SE1/4, Sec 22, T1N, R71W, S.P.M.,
SW1/4 NW1/4, Sec 23, T1N, R71W, S.P.M.,
and the
NW1/4 SW1/4, Sec 23, T1N, R71W, S.P.M.

Prepared By:

Douglas J. Stevenson
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February 28, 1997

This management plan has been prepared at my request to guide my forest management activities which I voluntarily apply on my property. Activities recommended in this plan are appropriate to my objectives and will benefit the natural resources on my property.

_____ _____

Jeanetta Schmidt Date

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OBJECTIVES: The forestry objectives for this property are:

1. Consistent with the Forest Agriculture and Stewardship Incentives Programs, to improve health and vigor of the forest and enhance its productivity.

2. Practice silviculture and multiple use management, giving particular attention to protection of wildlife habitat.

3. Preserve the aesthetic qualities of the property.

4. Protect soil and water resources.

LOCATION: The property is located on the east side of Sunshine Canyon Road, 8.0 miles west of the Boulder City Limits.

AREA: The property contains 105.9 acres, as determined from maps provided by Jeanetta Schmidt. Of this, 1.1 acres is occupied by Sunshine Canyon Road, leaving 104.8 forested acres.

BOUNDARY MONUMENTS: Corners are marked with aluminum caps on iron rebar, if they are marked at all. A few corners are marked with stone monuments. Most are unmarked.

ACCESS: Most of the property is steep. Access is by way of the driveway from Sunshine Canyon Road. Areas near the drive and along the top edge of the property are accessible to a pickup. The east end of the property will present access problems that may be insurmountable in the short run.

TOPOGRAPHY: The property occupies the south face of a minor hill in the ridge that contains Emancipation Hill and Bald Mountain. Aspects vary from east through south to southwest. Slopes average around 40%, some steeper, some shallower. The lowest point is at the southeast corner with an elevation of about 6440 feet above sea level. The highest point is along the north property line with an elevation of about 6760 feet above sea level.

GEOLOGY: Precambrian rocks now about 1.8 billion years old were intruded about 1.7 billion years ago by the Boulder Creek Granodiorite Formation. This is the bedrock throughout the property.

A north-northwest trending fault of Precambrian Age passes east of the property. It has occasionally been reactivated.

Lower Paleozoic rocks (Cambrian through Mississippian) are missing in this area. It is thought that these rocks once existed, but were eroded away during early Pennsylvanian times when the area was uplifted on the northeast flank of the Ancestral Front Range uplift, one of several northwest-trending mountain ranges that comprised the late Paleozoic Ancestral Rocky Mountains. These mountains (Ouachita Orogeny) resulted from the reactivation of Precambrian structures when Africa collided with South America and the southern edge of North America. Gravel and sediments washing off the Ancestral Front Range were deposited as the Fountain Formation, which was later uplifted to form the Flatirons. By the late Paleozoic, the Ancestral Front Range was eroded to a set of low hills.

In the early Cretaceous, the area began to subside and was eventually buried under almost 10,000 feet of marine sediment (Pierre Shale).

In the late Cretaceous-Early Tertiary (about 67.5 million years ago), the Laramide Orogeny uplifted a mountain range with much the same configuration as the present day Front Range. Erosion about balanced uplift so that the relief was never great, much less than at present. By the late Eocene the uplift ceased, leaving a low-profile range of hills. Most of the faulting and eastward tilting that raised the Flatirons into position occurred during the Laramide Orogeny.

Intrusive volcanic activity occurred to the east during the Paleocene, creating Valmont Dike and the basalt formation now being mined by Andesite Rock Company. No Paleocene igneous activity involved this property directly; however, the mineralization that created the Colorado Mineral Belt is associated with stocks, dikes and sills that intruded a major northeast-trending Precambrian shear zone about this time.

During the Oligocene this region was reduced to a plain, similar to eastern Colorado today with an elevation of about 3000 feet. In the Miocene, thermal uplift and east-west expansion formed the Rio Grande Rift and began the rise of the modern Front Range, which continues to rise today.

The property has never been glaciated (The nearest glacier almost reached Ward.), although Wisconsin-age and later climate fluctuations have had major impacts on plant life and continue to have an effect, even now.

SOILS: The soil is entirely Juget, mostly Juget very gravelly sandy loam.

Juget Soil Series[1]

The Juget series is made up of shallow, somewhat excessively drained soils. These soils formed on mountain slopes and ridges in sandy residuum weathered from granite. Slopes are 9 to 55 percent. Elevations are 6,300 to 8,200 feet. At lower elevations the native vegetation is mainly ponderosa pine, and at higher elevations it is Engelmann spruce and Douglas-fir with an understory of grass. Annual precipitation is 18 to 24 inches. Mean annual air temperature is 43° to 46° F., and the frost-free season is about 80 to 120 days.

In a representative profile the surface layer, about 6 inches thick, is dark-gray very gravelly sandy loam. The underlying material, about 5 inches thick, is brown very gravelly loamy sand. Underlying this layer is granite. Soil reaction is slightly acid.

Juget soils have rapid permeability. Available water capacity for the profile is low. Roots can penetrate to a depth of less than 20 inches.

These soils are used mainly for grazing, although some areas with scattered trees are used for recreation, forestry and homesites. The grass cover must be maintained to help prevent erosion.

Representative profile of Juget very gravelly sandy loam, in Juget-Rock outcrop complex, 9 to 55 percent slopes, located 2,540 feet north and 650 feet east of the southwest corner of sec. 11, T. 1 N., R. 71 W.:

A1 - 0 to 6 inches, dark-gray (10YR 4/1) very gravelly sandy loam, black (10YR 2/1) when moist; weak, very fine, granular structure; soft, very friable; 60 percent gravel and stone; slightly acid; clear, smooth boundary.

C - 6 to 11 inches, brown (10YR 5/3) very gravelly loamy sand, dark grayish brown (10YR 4/2) when moist; massive; hard, friable; about 80 percent fine gravel; slightly acid; clear, wavy boundary.

R - 11 inches, hard granite bedrock.

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[1]Moreland, Donald E. and Moreland, Ronald C., Soil Survey of Boulder County Area, Colorado, USDA - Soil Conservation Service, Denver, 1975.

The A1 horizon ranges from 4 to 8 inches in thickness and very gravelly sandy loam to very gravelly loamy sand in texture. Depth to bedrock ranges from 10 to 20 inches. The average rock fragment content of the soil ranges from 50 to 70 percent and is dominantly fine gravel.

Juget-Rock Outcrop Complex, 9 to 55 percent slopes (JrF). - This complex is made up of about 50 percent Juget very gravelly sandy loam and about 30 percent rock outcrop. .... The profile of the Juget soil in this complex is the one described as representative of the Juget series.

Included with this complex in mapping are small areas of Peyton soils near drainageways and a few small areas of Allens Park soils. These included soils make up about 20 percent of each mapped area.

Runoff is rapid on this complex. The erosion hazard is high. Juget soils take in water rapidly, but they retain only limited amounts for plant use because of their shallow depth to bedrock.

None of this complex is suitable for cultivation. It is in grass and scattered trees and shrubs. In the past, it was used for grazing livestock and for forestry, but now many areas are used for homesites, recreational purposes, and wildlife habitat. (Capability unit VIIs-1, nonirrigated; tree suitability group 2)

LOCAL MARKETS: Sawtimber markets in Boulder and vicinity are severely limited. Firewood markets are weaker than they were ten years ago, but still readily able to handle expected cutting.

TYPOLOGY AND STAND IDENTIFICATION: Western forests are typed by the dominant tree species occurring, provided that species makes up a plurality of stocking. When no species makes up at least 20% of the stand, the type is listed as "mixed." This property consists of ponderosa pine almost exclusively.

Size classes are as follows:

Class 1A: Seedlings (Less than 4.5 feet tall).
Class 1B: Saplings (4.5 feet tall to 5.0 inches DBH).
Class 2A: Small poles (5.0 to 7.0 inches DBH).
Class 2B: Large poles (7.0 to 9.0 inches DBH).
Class 2C: Near-merchantable (9.0 to 11.0 inches DBH).
Class 3A: Small sawtimber (11.0 to 15.0 inches DBH).
Class 3B: Medium sawtimber (15.0 to 21.0 inches DBH).
Class 4: Large sawtimber (21.0+ inches DBH).
Class 5: Large old growth (21.0+ inches DBH and greater than 150 years old.

A stand is classified by adding together stocking figures, starting with the highest class, until a minimum level of 32½ trees per acre, 10 square feet of basal area per acre or 250 board feet per acre is obtained over a minimum 3.0-acre area. This means that trees larger than the listed size class may occur in small numbers. Classes 2C through 5 are typed by board foot volume; classes 1B through 2B are typed by basal area and class 1A is typed by stem count.

There are no Class 4 or Class 5 stands on your property.

Pre-settlement stands in Boulder County are those with stand birthdates (See below.) of 1850 or earlier (Age: about 140 years). Stand birthdates are determined by taking mean age weighted by volume, basal area or stem count, as above, and subtracting that from the current year, rounding the result to the nearest decade. It is possible for a younger, faster-growing class of trees to overtake an older, slower-growing class and change the stand birthdate, without any other change in the stand.

Multiple classes: Real stands are rarely even-aged or all-aged, but consist of in-between mixes. Second and third classes of trees are typed as if they were separate stands, but the result is listed along with the dominant class. Second and third classes frequently differ from the dominant class.

Typology: Your timber is typed as ponderosa pine, small sawtimber (Class 3A), heavily-stocked with associated Douglas-fir, birthdate: 1890.

LAND USE: Current land use is investment for possible future sale as homesites. The owner makes recreational use of the property, is interested in enhancing its appearance and in reducing taxes. Product values are being considered because they are required by both Forest Agriculture and Stewardship Incentives.

The current forest type on the property originated following a major climatic shift at the end of the Pleistocene, about 11,000 years ago. Species that now occur at 8000 to 8500 feet of elevation, such as Douglas-fir, ponderosa and lodgepole pines, grew here. The forest was a wet version of the modern Front Range forest.

During the Altithermal, about 7000 to 9000 years ago, the climate became even warmer and dryer than it is now. Most of this property was probably grassland or pure stands of ponderosa pine during the Altithermal.

The current forest originated about 1760 following a major fire. This is surmised from the existence of a class of Douglas-firs on nearby property, all dating from about the same decade. The only known agent capable of large-scale land clearing over thousands of acres, is fire.

About 1853 a large fire burned the area west of Boulder, including most of western Boulder County. According to local legend, this fire was set by Arapahos, angry at being cheated by whites. One suspects the legend sprang up later so that whites would not have to take the blame for settlers' carelessness.

During the 1880s, the area was cut over to supply firewood and timbers for the mines. Mining operations in Boulder County used steam from wood-fired boilers to operate hoists and stampers.

Mountain pine beetles avoided this stand during the epidemic of the 1970s.

DESIRED CONDITIONS: Healthy, vigorous, fully-stocked stands of trees are required by both Forest Agriculture and Stewardship Incentives Programs. This condition need not be achieved immediately, but progress should be made in this direction.

It would be desirable to increase the area's usefulness to wildlife, indirectly enhancing recreational values. In particular, nesting sites for cavity-nesting birds and shelter piles for small animals would be beneficial.

IMPACT ON NEIGHBORS & NEARBY COMMUNITIES: Most cutting will be screened by intervening stands of trees so that it is not visible from the road. Slash cleanup within sight distance of a public road (out to 200 feet) is eligible for cost-sharing money. Also, in holes created by removal of damaged or deformed trees, seedlings can be planted (also under cost-sharing). No significant impact on neighbors or the public is anticipated.

WILDLIFE: Deer are very common on the property. The area is frequented by a mountain lion in late winter, and the usual assortment of rabbits, squirrels, chipmunks, ground-squirrels and other birds and small animals make use of it.

Threatened and Endangered: The U. S. Fish and Wildlife Service lists the following species for Boulder County:

American peregrine falcon, Falco peregrinus, Endangered
Bald eagle, Haliaeetus leucocephalus, Endangered
Whooping crane, Grus americana, Endangered
Eskimo curlew, Numenius borealis, Endangered
White-faced ibis, Plegadis chihi, Category 2
Mountain plover, Charadrius montanus, Category 1
Northern goshawk, Accipiter gentilis, Category 2
Black tern, Chlidonias niger, Category 2
Mexican spotted owl, Strix occidentalis lucida, Threatened
Loggerhead shrike, Lanius ludovicianus, Category 2
Boreal toad, Bufo boreas boreas, Category 2
Black-footed ferret, Mustela nigripes, Endangered
Preble's meadow jumping mouse, Zapus hudsonius preblei, Category 2
Fringed-tailed myotis, Myotis thysanodes pahasapensis, Category 2
North American wolverine, Gulo gulo luscus, Category 2
Swift fox, Vulpes velox, Category 2
Greenback cutthroat trout, Oncorhynchus clarki stomias, Threatened
Plains topminnow, Fundulus sciadicus, Category 2
Rocky Mountain capshell, Acroloxus coloradensis, Category 2
Regal fritillary butterfly, Speyeria idalia, Category 2
Lost ethmiid moth, Ethmia monachella, Category 2

The following plants are also listed:

Bell's twinpod, Physaria bellii, Category 2
Larimer aletes, Aletes humilis, Category 2
Ute ladies'-tresses orchid, Spiranthes diluvialis, Threatened
Colorado butterflyweed, Gaura neomexicana coloradensis, Category 1
Showy prairie gentian, Eustoma granfiflorum, Category 2
Pale moonwort, Botrichium pallidum, Category 2
Purple lady's slipper orchid, Cypripedium fasciculatum, Category 2

The peregrine falcon and bald eagle have been observed in Boulder County numerous times since 1987. The white-faced ibis has been observed just across the county line at Continental Pond in Weld County in the fall of 1994.

The purple lady's slipper has been observed several times since 1987.

The Mexican spotted owl occurred in Boulder County historically, but has not been seen here since the Threatened and Endangered Species Act was passed in 1973. The nearest known nest is located south of Denver in Douglas County. A detailed search of

Coal Creek, Boulder and Lefthand canyons and their tributaries is planned for the summer of 1995.

The northern goshawk is favored by the many age classes of trees created by rotational cutting. As long as buffer zones are left around nests (30 acres) and cutting activities avoid a fledging area (400 acres) during the fledging season, there should be no problems. Though this bird may occur in Boulder County, I am not aware of it.

To the best of my knowledge, the black-footed ferret is listed only because its prey (prairie-dogs) is found here. I do not know of any sightings. The ferret is a creature of the plains and would not pose a problem for most mountain projects.

The whooping crane was included on the list because it might come here during migration. Again, I am not aware of any sightings. The same applies to the Eskimo curlew.

The Ute ladies'-tresses only occurs below 7000 feet; there is no need to worry about it at higher elevations.

The black tern is a shorebird and is a concern around creeks and reservoirs, but not in the mountains, away from water.

The black-footed ferret, preble's meadow jumping mouse, fringed-tailed myotis, Colorado butterflyweed and showy prairie gentian occur only in the plains. The mountain plover, northern goshawk, Mexican spotted owl and purple lady's slipper occur only in the mountains (except for a single spotted owl sighting in Adams County).

Other listed species could occur in either mountains or plains, especially areas where forest and prairie intermix.

Wildlife Habitat Opportunities: There are a number of practices that could be implemented to enhance the property's usefulness to various species of wildlife. Several ideas are:

1. A meadow created by clear-cutting a dwarf-mistletoe patch can be used by western blue birds if there is adequate nesting cover nearby. In this case, nesting boxes will be needed as there are almost no useable snag trees in the area. The Division of Wildlife is cooperating with a Boulder resident, Ruth Steel, to provide needed boxes at cost. Cost-sharing money is available to help with even this small amount. The property could support six families of blue-birds.

2. Slash left over from dwarf-mistletoe work can be piled to create shelter for small animals ("bunny houses"). A few larger pieces will be needed to hold slash off the ground

and permit access, so some three-to-six-inch diameter material will be preserved during cutting. These are constructed shelter piles and not just a haphazard pile designed more to make the site look nice than to provide animal cover.

3. A shrub thicket consisting of 250 Woods roses, golden currants or caraganas could be planted in a tenth-acre block to provide food and cover.

In order to meet Stewardship requirements, at least one wildlife practice must be implemented. There are scores of such practices; the above are intended only as suggestions. The practice is cost-sharable.

INVENTORY: This is a ponderosa pine, heavily-stocked, small sawtimber stand. Sawtimber stocking totals about 2300 board feet per acre, on average. The stand averages 118 square feet of basal area per acre, or about 348 trees per acre. It originated about 1890, apparently following a fire.

Dwarf-mistletoe was not observed during field work, but it could easily have been missed.

Except along the driveway, it is not accessible to fire trucks due to steep terrain. An engine strike team could attack a fire from the county road at the bottom of the hill, but that could not prevent the stand's destruction. Thinning would make it possible for fire to pass through this stand without doing serious harm.

Harvesting operations are somewhat limited by steep terrain and fragile soils; it may not be possible to harvest the east end of the stand commercially.

There are no wetland or riparian areas in this stand.

Silvicultural objectives for this stand are to maximize growth by thinning to 100 square feet per acre of basal area.

No cultural features were observed in this stand.

No noxious weeds were observed; the crown cover is too thick to allow many understory plants to grow. Under Colorado's weed ordinance, "weed" is defined by local districts. Exactly what is a "weed" is can vary from place-to-place and time-to-time.

No endangered or threatened plant species were observed (A thorough survey would require repeated visits to likely sites throughout the course of a year, something beyond the scope of this plan.).

Only the southwest end of this stand is visible from a public road. There should be no problems with visual impacts.

There are no known archeological sites within this stand.

PRESCRIPTION BY MANAGEMENT UNIT: Thin to 100 square feet of basal area per acre. This should be done as rapidly as possible to allow the greatest length of time for tree growth, but not slower than 7.1 acres per year, with the entire operation spread over 15 years. Mature trees will be "stored on the stump" until there are enough to make harvesting silviculturally desirable (probably about 2010-2020). Selected trees will be killed and left as wildlife trees. Following thinning, unoccupied holes in the stand will be filled by planting ponderosa pine seedlings.

In areas where access is difficult, slash could be piled for animal shelter ("bunny huts").

Colorado State Forest Service foresters will set work standards. If a contractor is used to do part of the work, standard CSFS cutting regulations will apply. Landowner may set her own rules for slash and cleanup requirements for work that she does or administers herself.

Accessibility will determine the order in which work is implemented - accessible areas first.

IMPLEMENTATION SCHEDULE:

1997: A. Thin 20.1 acres (Block 1997[2]; acreage includes areas for 1995 and 1996.). If stumpage cannot be sold by late October, it may be necessary to do the work non-commercially.

B. Conduct a dwarf-mistletoe survey of the property.

1998: A. Thin 7.1 acres (Block 1998).

B. Clean dwarf-mistletoe from Block 1997 as needed. Dwarf-mistletoe cleaning can be cost-shared through the Stewardship Incentives Program. The Federal government can reimburse 65% of actual cost up to $200

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[2]Blocks will be selected by forester and landowner together just prior to marking the stand for thinning. Thinning products will be sold. This operation is usually done "in the black;" though profits are not great.

per acre for the first cleaning (cost-shared as Woodland Improvement) and up to $47 per acre for the second, third and fourth cleanings (cost-shared as Pruning).

Dwarf-mistletoe was not actually observed in your stands, but it is an unusual stand in Boulder County that doesn't have a few infections. If there are no infections in a particular year's block, this requirement will be considered to have been met.

1999: A. Thin 7.1 acres (Block 1999).

B. Clean dwarf-mistletoe from Block 1997 and 1998 as needed.

2000: A. Thin 7.1 acres (Block 2000).

B. Clean dwarf-mistletoe from Blocks 1997, 1998 and 1999.

2001: A. Thin 7.1 acres (Block 2001).

B. Clean dwarf-mistletoe from Blocks 1997, 1998, 1999 and 2000. This is the last cleaning for Block 1997, which should be free of dwarf-mistletoe by this time, anyway.

2002: A. Thin 7.1 acres (Block 2002).

B. Clean dwarf-mistletoe from Blocks 1998, 1999, 2000 and 2001.

C. Plant enough seedlings in Block 1997 to bring stocking to 100 GSL. Most Blocks will be close to this level after thinning, so relatively few seedlings will be needed.). Besides being eligible for cost-sharing (Reforestation), this practice is also eligible for special income tax treatment. This includes the 10% investment tax credit for unreimbursed out-of-pocket costs and a deduction against income (This amount is determined by amortizing the out-of-pocket costs over 84 months using a straight-line amortization, half-year convention.) Consult your tax preparer for details as there are some limitations.

D. Update this plan, if needed. "The best-laid plans of mice and men...."

2003: A. Thin 7.1 acres (Block 2003).

B. Clean dwarf-mistletoe from Blocks 1999, 2000, 2001 and 2000.

C. Plant enough seedlings in Block 1997 to bring stocking to 100 GSL.

D. Replace failed seedlings in Block 1997. One replacement is usually enough and frequently even that is not needed. This is the last treatment for Block 1997 in this planning cycle.

2004: A. Thin 7.1 acres (Block 2004).

B. Clean dwarf-mistletoe from Blocks 2000, 2001, 2002 and 2003.

C. Plant enough seedlings in Block 1999 to bring stocking to 100 GSL.

D. Replace failed seedlings in Block 1998. This is the last treatment for Block 1998 in this planning cycle.

2005: A. Thin 7.1 acres (Block 2005).

B. Clean dwarf-mistletoe from Blocks 2001, 2002, 2003 and 2004.

C. Plant enough seedlings in Block 2000 to bring stocking to 100 GSL.

D. Replace failed seedlings in Block 1999. This is the last treatment for Block 1999 in this planning cycle.

2006: A. Thin 7.1 acres (Block 2006).

B. Clean dwarf-mistletoe from Blocks 2002, 2003, 2004 and 2004.

C. Plant enough seedlings in Block 2001 to bring stocking to 100 GSL.

D. Replace failed seedlings in Block 2000. This is the last treatment for Block 2000 in this planning cycle.

E. Have new plan prepared. Both programs require that a new plan be prepared every ten years. Revisions are only required if there is a need, such as a change in ownership or acres in the program, or production schedules no longer have any relation to the original plan.

Activities anticipated in the next planning cycle:

1. Complete initial thinning program in 2008.

2. Begin light thinning program in 2010 on an as-needed basis. Combine this with light dwarf-mistletoe work, also on an as-needed basis.

3. Complete dwarf-mistletoe treatments in 2012.

4. Complete planting, including maintenance plantings in 2014.

From 2014 to 2021 only light thinning work is anticipated.

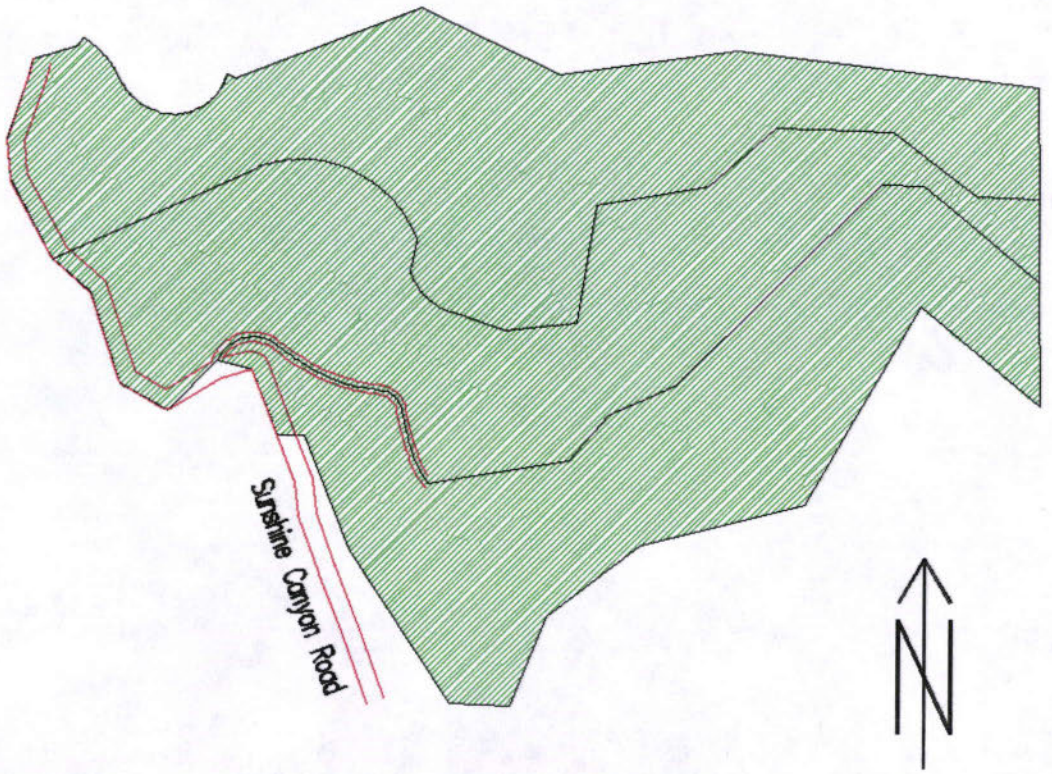
SUMMARY: Though this property will not produce large profits from forest products, it can produce a small, steady income. It can also produce recreation and opportunities just to enjoy the out-of-doors.

With proper care by interested landowners, the productivity of our forests is assured.

Respectfully submitted by

Douglas J. Stevenson
Assistant District Forester

Scale: 1:7624; 1 Inch = 635 Feet



Sunshine Forest

Jeanetta Schmidt

Part of

Sections 22 and 23, T1N, R71W, S.P.M.

Property Line

Road

Ponderosa Pine

Drawn By: Douglas J. Stevenson

February 28, 1997

FOREST AGRICULTURE and STEWARDSHIP INCENTIVES PLAN

SUNSHINE CANYON TREE FARM

JEANETTA SCHMIDT
Box 771167
Steamboat Springs, CO 80477
(303) 879-5721 (H)
(303) 879-8814 (O)

Parts of the
S1/2 NE1/4, Sec 22, T1N, R71W, S.P.M.,
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Prepared By:

Douglas J. Stevenson
Colorado State Forest Service
936 Lefthand Canyon
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(303) 442-0428

January 13, 1995

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Jeanetta Schmidt Date

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2. Practice silviculture and multiple use management, giving particular attention to protection of wildlife habitat.

3. Preserve the aesthetic qualities of the property.

4. Protect soil and water resources.

GENERAL DESCRIPTION

Property Location: The property is located on the east side of Sunshine Canyon Road, 8.0 miles west of the Boulder City Limits.

Area: The property contains 70.7 acres, as determined from maps provided by Jeanetta Schmidt. Of this, 1.1 acres is occupied by Sunshine Canyon Road, leaving 69.6 forested acres. There are no houses or meadows, so 69.6 acres is the area for both the Forest Agriculture and Stewardship Incentives Programs.

Boundary Monuments: Corners are marked with aluminum caps on iron rebar, if they are marked at all. A few corners are marked with stone monuments. Most are unmarked.

Access: Most of the property is steep. Access is by way of the driveway from Sunshine Canyon Road. Areas near the drive and along the top edge of the property are accessible to a pickup. The east end of the property will present access problems that may be insurmountable in the short run.

TOPOGRAPHY

Slopes and Aspects: Aspects vary from east through south to southwest. Slopes average around 40%, some steeper, some shallower.

Elevation: The lowest point is at the southeast corner with an elevation of about 6440 feet above sea level. The highest point is along the north property line with an elevation of about 6700 feet above sea level.

Geology: Precambrian rocks now about 1.8 billion years old were intruded about 1.7 billion years ago by the Boulder Creek Granodiorite Formation. This is the bedrock throughout the property.

A north-northwest trending fault of Precambrian Age passes east of the property. It has occasionally been reactivated.

Lower Paleozoic rocks (Cambrian through Mississippian) are missing in this area. It is thought that these rocks once existed, but were eroded away during early Pennsylvanian times when the area was uplifted on the northeast flank of the Ancestral Front Range uplift, one of several northwest-trending mountain ranges that comprised the late Paleozoic Ancestral Rocky Mountains. These mountains (Ouachita Orogeny) resulted from the reactivation of Precambrian structures when Africa collided with South America and the southern edge of North America. Gravel and sediments washing off the Ancestral Front Range were deposited as the Fountain Formation, which was later uplifted to form the Flatirons. By the late Paleozoic, the Ancestral Front Range was eroded to a set of low hills.

In the early Cretaceous, the area began to subside and was eventually buried under almost 10,000 feet of marine sediment (Pierre Shale).

In the late Cretaceous-Early Tertiary (about 67.5 million years ago), the Laramide Orogeny uplifted a mountain range with much the same configuration as the present day Front Range. Erosion about balanced uplift so that the relief was never great, much less than at present. By the late Eocene the uplift ceased, leaving a low-profile range of hills. Most of the faulting and eastward tilting that raised the Flatirons into position occurred during the Laramide Orogeny.

Intrusive volcanic activity occurred to the east during the Paleocene, creating Valmont Dike and the basalt formation now being mined by Andesite Rock Company. No Paleocene igneous activity involved this property directly; however, the mineralization that created the Colorado Mineral Belt is associated with stocks, dikes and sills that intruded a major northeast-trending Precambrian shear zone about this time.

During the Oligocene this region was reduced to a plain, similar to eastern Colorado today with an elevation of about 3000 feet. In the Miocene, thermal uplift and east-west expansion formed the

Rio Grande Rift and began the rise of the modern Front Range, which continues to rise today.

The property has never been glaciated (The nearest glacier almost reached Ward.), although Wisconsin-age and later climate fluctuations have had major impacts on plant life and continue to have an effect, even now.

Soils: The soil is entirely Juget, mostly Juget very gravelly sandy loam.

Juget Soil Series[1]

The Juget series is made up of shallow, somewhat excessively drained soils. These soils formed on mountain slopes and ridges in sandy residuum weathered from granite. Slopes are 9 to 55 percent. Elevations are 6,300 to 8,200 feet. At lower elevations the native vegetation is mainly ponderosa pine, and at higher elevations it is Engelmann spruce and Douglas-fir with an understory of grass. Annual precipitation is 18 to 24 inches. Mean annual air temperature is 43° to 46° F., and the frost-free season is about 80 to 120 days.

In a representative profile the surface layer, about 6 inches thick, is dark-gray very gravelly sandy loam. The underlying material, about 5 inches thick, is brown very gravelly loamy sand. Underlying this layer is granite. Soil reaction is slightly acid.

Juget soils have rapid permeability. Available water capacity for the profile is low. Roots can penetrate to a depth of less than 20 inches.

These soils are used mainly for grazing, although some areas with scattered trees are used for recreation, forestry and homesites. The grass cover must be maintained to help prevent erosion.

Representative profile of Juget very gravelly sandy loam, in Juget-Rock outcrop complex, 9 to 55 percent slopes, located 2,540 feet north and 650 feet east of the southwest corner of sec. 11, T. 1 N., R. 71 W.:

A1 - 0 to 6 inches, dark-gray (10YR 4/1) very gravelly sandy loam, black (10YR 2/1) when moist; weak, very fine, granular structure; soft, very friable; 60 percent

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[1]Moreland, Donald E. and Moreland, Ronald C., Soil Survey of Boulder County Area, Colorado, USDA - Soil Conservation Service, Denver, 1975.

gravel and stone; slightly acid; clear, smooth boundary.
C - 6 to 11 inches, brown (10YR 5/3) very gravelly loamy sand, dark grayish brown (10YR 4/2) when moist; massive; hard, friable; about 80 percent fine gravel; slightly acid; clear, wavy boundary.
R - 11 inches, hard granite bedrock.

The A1 horizon ranges from 4 to 8 inches in thickness and very gravelly sandy loam to very gravelly loamy sand in texture. Depth to bedrock ranges from 10 to 20 inches. The average rock fragment content of the soil ranges from 50 to 70 percent and is dominantly fine gravel.

Juget-Rock Outcrop Complex, 9 to 55 percent slopes (JrF). - This complex is made up of about 50 percent Juget very gravelly sandy loam and about 30 percent rock outcrop. .... The profile of the Juget soil in this complex is the one described as representative of the Juget series.

Included with this complex in mapping are small areas of Peyton soils near drainageways and a few small areas of Allens Park soils. These included soils make up about 20 percent of each mapped area.

Runoff is rapid on this complex. The erosion hazard is high. Juget soils take in water rapidly, but they retain only limited amounts for plant use because of their shallow depth to bedrock.

None of this complex is suitable for cultivation. It is in grass and scattered trees and shrubs. In the past, it was used for grazing livestock and for forestry, but now many areas are used for homesites, recreational purposes, and wildlife habitat. (Capability unit VIIs-1, nonirrigated; tree suitability group 2)

LOCAL MARKETS

Sawtimber markets in Boulder and vicinity are severely limited. Firewood markets are weaker than they were ten years ago, but still readily able to handle expected cutting.

TYPOLOGY AND STAND IDENTIFICATION

Western forests are typed by the dominant tree species occurring, provided that species makes up a plurality of stocking. When no species makes up at least 20% of the stand, the type is listed as "mixed." This property consists of ponderosa pine almost exclusively.

Size classes are as follows:

Class 1A: Seedlings (Less than 4.5 feet tall).
Class 1B: Saplings (4.5 feet tall to 5.0 inches DBH).
Class 2A: Small poles (5.0 to 7.0 inches DBH).
Class 2B: Large poles (7.0 to 9.0 inches DBH).
Class 2C: Near-merchantable (9.0 to 11.0 inches DBH).
Class 3A: Small sawtimber (11.0 to 15.0 inches DBH).
Class 3B: Medium sawtimber (15.0 to 21.0 inches DBH).
Class 4: Large sawtimber (21.0+ inches DBH).
Class 5: Large old growth (21.0+ inches DBH and greater than 150 years old.

A stand is classified by adding together stocking figures, starting with the highest class, until a minimum level of 32½ trees per acre, 10 square feet of basal area per acre or 250 board feet per acre is obtained over a minimum 3.0-acre area. This means that trees larger than the listed size class may occur in small numbers. Classes 2C through 5 are typed by board foot volume; classes 1B through 2B are typed by basal area and class 1A is typed by stem count.

There are no Class 4 or Class 5 stands on your property.

Pre-settlement stands in Boulder County are those with stand birthdates (See below.) of 1850 or earlier (Age: about 140 years). Stand birthdates are determined by taking mean age weighted by volume, basal area or stem count, as above, and subtracting that from the current year, rounding the result to the nearest decade. It is possible for a younger, faster-growing class of trees to overtake an older, slower-growing class and change the stand birthdate, without any other change in the stand.

Multiple classes: Real stands are rarely even-aged or all-aged, but consist of in-between mixes. Second and third classes of trees are typed as if they were separate stands, but the result is listed along with the dominant class. Second and third classes frequently differ from the dominant class.

Typology: Your timber is typed as ponderosa pine, small sawtimber (Class 3A), heavily-stocked with associated Douglas-fir, birthdate: 1890.

LAND USE

Current: Current land use is investment for possible future sale as homesites. The owner makes recreational use of the property, is interested in enhancing its appearance and in reducing taxes.

Product values are being considered because they are required by both Forest Agriculture and Stewardship Incentives.

Historical: The current forest type on the property originated following a major climatic shift at the end of the Pleistocene, about 11,000 years ago. Species that now occur at 8000 to 8500 feet of elevation, such as Douglas-fir, ponderosa and lodgepole pines, grew here. The forest was a wet version of the modern Front Range forest.

During the Altithermal, about 7000 to 9000 years ago, the climate became even warmer and dryer than it is now. Most of this property was probably grassland or pure stands of ponderosa pine during the Altithermal.

The current forest originated about 1760 following a major fire. This is surmised from the existence of a class of Douglas-firs on nearby property, all dating from about the same decade. The only known agent capable of large-scale land clearing over thousands of acres, is fire.

About 1853 a large fire burned the area west of Boulder, including most of western Boulder County. According to local legend, this fire was set by Arapahos, angry at being cheated by whites. One suspects the legend sprang up later so that whites would not have to take the blame for settlers' carelessness.

During the 1880s, the area was cut over to supply firewood and timbers for the mines. Mining operations in Boulder County used steam from wood-fired boilers to operate hoists and stampers.

Mountain pine beetles avoided this stand during the epidemic of the 1970s.

DESIRED CONDITIONS

Healthy, vigorous, fully-stocked stands of trees are required by both Forest Agriculture and Stewardship Incentives Programs. This condition need not be achieved immediately, but progress should be made in this direction.

It would be desirable to increase the area's usefulness to wildlife, indirectly enhancing recreational values. In particular, nesting sites for cavity-nesting birds and shelter piles for small animals would be beneficial.

IMPACT ON NEIGHBORS & NEARBY COMMUNITIES

Most cutting will be screened by intervening stands of trees so that it is not visible from the road. Slash cleanup within sight distance of a public road (out to 200 feet) is eligible for cost-sharing money. Also, in holes created by removal of damaged or deformed trees, seedlings can be planted (also under cost-sharing). No significant impact on neighbors or the public is anticipated.

WILDLIFE

WILDLIFE: Deer are very common on the property. The area is frequented by a mountain lion in late winter, and the usual assortment of rabbits, squirrels, chipmunks, ground-squirrels and other birds and small animals make use of it.

Threatened and Endangered

The U. S. Fish and Wildlife Service lists the following species for Boulder County:

American peregrine falcon, Falco peregrinus, Endangered
Bald eagle, Haliaeetus leucocephalus, Endangered
Whooping crane, Grus americana, Endangered
Eskimo curlew, Numenius borealis, Endangered
White-faced ibis, Plegadis chihi, Category 2
Mountain plover, Charadrius montanus, Category 1
Northern goshawk, Accipiter gentilis, Category 2
Black tern, Chlidonias niger, Category 2
Mexican spotted owl, Strix occidentalis lucida, Threatened
Loggerhead shrike, Lanius ludovicianus, Category 2
Boreal toad, Bufo boreas boreas, Category 2
Black-footed ferret, Mustela nigripes, Endangered
Preble's meadow jumping mouse, Zapus hudsonius preblei, Category 2
Fringed-tailed myotis, Myotis thysanodes pahasapensis, Category 2
North American wolverine, Gulo gulo luscus, Category 2
Swift fox, Vulpes velox, Category 2
Greenback cutthroat trout, Oncorhynchus clarki stomias, Threatened
Plains topminnow, Fundulus sciadicus, Category 2
Rocky Mountain capshell, Acroloxus coloradensis, Category 2
Regal fritillary butterfly, Speyeria idalia, Category 2
Lost ethmiid moth, Ethmia monachella, Category 2

The following plants are also listed:

Bell's twinpod, Physaria bellii, Category 2
Larimer aletes, Aletes humilis, Category 2
Ute ladies'-tresses orchid, Spiranthes diluvialis, Threatened
Colorado butterflyweed, Gaura neomexicana coloradensis, Category 1
Showy prairie gentian, Eustoma granfiflorum, Category 2
Pale moonwort, Botrichium pallidum, Category 2
Purple lady's slipper orchid, Cypripedium fasciculatum, Category 2

The peregrine falcon and bald eagle have been observed in Boulder County numerous times since 1987. The white-faced ibis has been observed just across the county line at Continental Pond in Weld County in the fall of 1994.

The purple lady's slipper has been observed several times since 1987.

The Mexican spotted owl occurred in Boulder County historically, but has not been seen here since the Threatened and Endangered Species Act was passed in 1973. The nearest known nest is located south of Denver in Douglas County. A detailed search of Coal Creek, Boulder and Lefthand canyons and their tributaries is planned for the summer of 1995.

The northern goshawk is favored by the many age classes of trees created by rotational cutting. As long as buffer zones are left around nests (30 acres) and cutting activities avoid a fledging area (400 acres) during the fledging season, there should be no problems. Though this bird may occur in Boulder County, I am not aware of it.

To the best of my knowledge, the black-footed ferret is listed only because its prey (prairie-dogs) is found here. I do not know of any sightings. The ferret is a creature of the plains and would not pose a problem for most mountain projects.

The whooping crane was included on the list because it might come here during migration. Again, I am not aware of any sightings. The same applies to the Eskimo curlew.

The Ute ladies'-tresses only occurs below 7000 feet; there is no need to worry about it at higher elevations.

The black tern is a shorebird and is a concern around creeks and reservoirs, but not in the mountains, away from water.

The black-footed ferret, preble's meadow jumping mouse, fringed-tailed myotis, Colorado butterflyweed and showy prairie gentian occur only in the plains. The mountain plover, northern goshawk, Mexican spotted owl and purple lady's slipper occur only in the mountains (except for a single spotted owl sighting in Adams County).

Other listed species could occur in either mountains or plains, especially areas where forest and prairie intermix.

Wildlife Habitat Opportunities: There are a number of practices that could be implemented to enhance the property's usefulness to various species of wildlife. Several ideas are:

1. A meadow created by clear-cutting a dwarf-mistletoe patch can be used by western blue birds if there is adequate nesting cover nearby. In this case, nesting boxes will be needed as there are almost no useable snag trees in the area. The Division of Wildlife is cooperating with a Boulder resident, Ruth Steel, to provide needed boxes at cost. Cost-sharing money is available to help with even this small amount. The property could support six families of bluebirds.

2. Slash left over from dwarf-mistletoe work can be piled to create shelter for small animals ("bunny houses"). A few larger pieces will be needed to hold slash off the ground and permit access, so some three-to-six-inch diameter material will be preserved during cutting. These are constructed shelter piles and not just a haphazard pile designed more to make the site look nice than to provide animal cover.

3. A shrub thicket consisting of 250 Woods roses, golden currants or caraganas could be planted in a tenth-acre block to provide food and cover.

In order to meet Stewardship requirements, at least one wildlife practice must be implemented. There are scores of such practices; the above are intended only as suggestions. The practice is cost-sharable.

INVENTORY

This is a ponderosa pine, heavily-stocked, small sawtimber stand. Sawtimber stocking totals about 2400 board feet per acre, on average. The stand averages 122 square feet of basal area per acre, or about 366 trees per acre. It originated about 1890, apparently following a fire.

Dwarf-mistletoe was not observed during field work, but it could easily have been missed.

Except along the driveway, it is not accessible to fire trucks due to steep terrain. An engine strike team could attack a fire from the county road at the bottom of the hill, but that could not prevent the stand's destruction. Thinning would make it possible for fire to pass through this stand without doing serious harm.

Harvesting operations are somewhat limited by steep terrain and fragile soils; it may not be possible to harvest the east end of the stand commercially.

There are no wetland or riparian areas in this stand.

Silvicultural objectives for this stand are to maximize growth by thinning to 100 square feet per acre of basal area.

No cultural features were observed in this stand.

No noxious weeds were observed; the crown cover is too thick to allow many understory plants to grow. Under Colorado's weed ordinance, "weed" is defined by local districts. Exactly what is a "weed" is can vary from place-to-place and time-to-time.

No endangered or threatened plant species were observed (A thorough survey would require repeated visits to likely sites throughout the course of a year, something beyond the scope of this plan.).

Only the southwest end of this stand is visible from a public road. There should be no problems with visual impacts.

There are no known archeological sites within this stand.

PRESCRIPTION BY MANAGEMENT UNIT

Thin to 100 square feet of basal area per acre. This should be done as rapidly as possible to allow the greatest length of time for tree growth, but not slower than 5.9 acres per year, with the entire operation spread over 12 years. Mature trees will be "stored on the stump" until there are enough to make harvesting silviculturally desirable (probably about 2010-2020). Selected trees will be killed and left as wildlife trees. Following thinning, unoccupied holes in the stand will be filled by planting ponderosa pine seedlings.

In areas where access is difficult, slash could be piled for animal shelter ("bunny huts").

Colorado State Forest Service foresters will set work standards. If a contractor is used to do part of the work, standard CSFS cutting regulations will apply. Landowner may set her own rules for slash and cleanup requirements for work that she does or administers herself.

Accessibility will determine the order in which work is implemented - accessible areas first.

IMPLEMENTATION SCHEDULE and RECORD

RECOMMENDED PRACTICES, YEAR IMPLEMENTED, UNITS COMPLETED

1995:

Thin 5.9 acres (Block 1995[2]).

1996:

1. Thin 5.9 acres (Block 1996).

2. Clean dwarf-mistletoe from Block 1995 as needed. Dwarf-mistletoe cleaning can be cost-shared through the Stewardship Incentives Program. The Federal government can reimburse 65% of actual cost up to $200 per acre for the first cleaning (cost-shared as Woodland Improvement) and up to $47 per acre for the second, third and fourth cleanings (cost-shared as Pruning).

   Dwarf-mistletoe was not actually observed in your stands, but it is an unusual stand in Boulder County that doesn't have a few infections. If there are no infections in a particular year's block, this requirement will be considered to have been met.

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[2]Blocks will be selected by forester and landowner together just prior to marking the stand for thinning. Thinning products will be sold. This operation is usually done "in the black;" though profits are not great.

1997:

1. Thin 5.9 acres (Block 1997).

2. Clean dwarf-mistletoe from Block 1995 and 1996 as needed.

1998:

1. Thin 5.9 acres (Block 1998).

2. Clean dwarf-mistletoe from Blocks 1995, 1996 and 1997.

1999:

1. Thin 5.9 acres (Block 1999).

2. Clean dwarf-mistletoe from Blocks 1995, 1996, 1997 and 1998. This is the last cleaning for Block 1995, which should be free of dwarf-mistletoe by this time, anyway.

2000:

1. Thin 5.9 acres (Block 2000).

2. Clean dwarf-mistletoe from Blocks 1996, 1997, 1998 and 1999.

3. Plant enough seedlings in Block 1995 to bring stocking to 100 GSL. Most Blocks will be close to this level after thinning, so relatively few seedlings will be needed.). Besides being eligible for cost-sharing (Reforestation), this practice is also eligible for special income tax treatment. This includes the 10% investment tax credit for unreimbursed out-of-pocket costs and a deduction against income (This amount is determined by amortizing the out-of-pocket costs over 84 months using a straight-line amortization, half-year convention.) Consult your tax preparer for details as there are some limitations.

2001:

1. Thin 5.9 acres (Block 2001).

2. Clean dwarf-mistletoe from Blocks 1997, 1998, 1999 and 2000.

3. Plant enough seedlings in Block 1996 to bring stocking to 100 GSL.

4. Replace failed seedlings in Block 1995. One replacement is usually enough and frequently even that is not needed. This is the last treatment for Block 1995 in this planning cycle.

2002:

1. Thin 5.9 acres (Block 2002).

2. Clean dwarf-mistletoe from Blocks 1998, 1999, 2000 and 2001.

3. Plant enough seedlings in Block 1997 to bring stocking to 100 GSL.

4. Replace failed seedlings in Block 1996. This is the last treatment for Block 1996 in this planning cycle.

2003:

1. Thin 5.9 acres (Block 2003).

2. Clean dwarf-mistletoe from Blocks 1999, 2000, 2001 and 2002.

3. Plant enough seedlings in Block 1998 to bring stocking to 100 GSL.

4. Replace failed seedlings in Block 1997. This is the last treatment for Block 1997 in this planning cycle.

2004:

1. Thin 5.9 acres (Block 2004).

2. Clean dwarf-mistletoe from Blocks 2000, 2001, 2002 and 2003.

3. Plant enough seedlings in Block 1999 to bring stocking to 100 GSL.

4. Replace failed seedlings in Block 1998. This is the last treatment for Block 1998 in this planning cycle.

5. Have new plan prepared. Both programs require that a new plan be prepared every ten years. Revisions are only required if there is a need, such as a change in ownership or acres in the program, or production schedules no longer have any relation to the original plan.

Activities anticipated in the next planning cycle:

1. Complete initial thinning program in 2006.

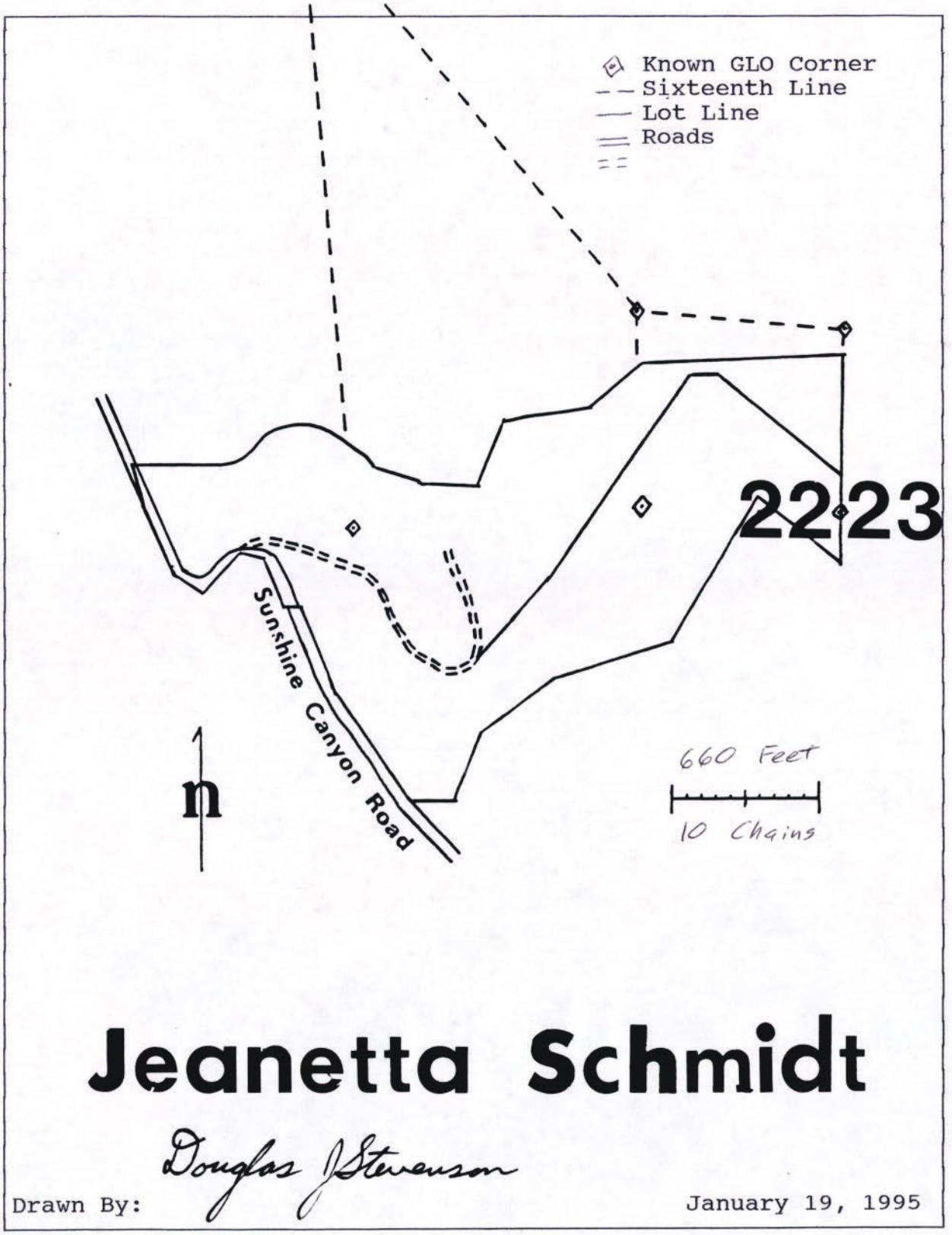
2. Begin light thinning program in 2008 on an as-needed basis. Combine this with light dwarf-mistletoe work, also on an as-needed basis.

3. Complete dwarf-mistletoe treatments in 2010.

4. Complete planting, including maintenance plantings in 2012.

From 2012 to 2019 only light thinning work is anticipated.

RECORDS and MAPS; TREATMENTS, DATES COMPLETED, VOLUME HARVESTED; PRICE RECEIVED, MANAGEMENT COSTS.



Jeanetta Schmidt

Douglas J Stevenson

Drawn By:

January 19, 1995

PONDEROSA PINE (Pinus ponderosa Laws.)[3]

BOTANICAL FEATURES

Needles in 3's, or 2's on the same tree, 5" to 11" long, dark gray-green to yellow-green, flexible, persistent until the 3rd season. Crushed needles have a turpentine odor similar to that of most other pines.
Cones 3" to 6" long, ovoid to ellipsoidal, sessile, solitary or clustered; usually leaving a few basal scales attached to the twig, when shed; apophysis dark reddish brown to dull brownish yellow, transversely ridges and more or less diamond-shaped; umbo dorsal, with a slender, often deciduous prickle; seeds ¼" long, ovoid, slightly compressed toward the apex, brownish purple; wings moderately wide, about 1" long; about 12,000 (6,900-23,000) seeds to the pound.
Twigs stout, exhaling a turpentine odor when bruised; buds usually covered with droplets of resin.

Bark brown to black and deeply furrowed on vigorous or young trees (bull pines); yellowish brown to cinnamon-red and broken into large flat, superficially scaly plates separated by deep irregular fissures on slow-growing and old trunks.

GENERAL DESCRIPTION

This is the most important pine in western North America, and in the United States is found in commercial quantities in every state west of the Great Plains. At present it furnishes more timber than any other American pine and in terms of total annual production of lumber by species is second only to Douglas-fir.

Ponderosa pine is a large tree 150 to 180 feet high and 3 to 4 ft in diameter (On the best sites, 300-year-old dominant trees average about 175 ft high and 48 in. d.b.h.) (max. 262 by 8.6 ft). Even though this species commonly forms open parklike forests, the boles are ordinarily symmetrical and clear for one-half or more of their length; short conical or flat-topped crowns are characteristic of old trees. Four-year-old trees may have taproots four to five feet long. Moderately deep wide-spreading laterals develop as the trees get older. Ponderosa pine is not exacting in its soil requirements, but trees on thin, dry soils are usually dwarfed. Its occurrence on dry sites with the nut pines and certain of the junipers in indicative of its great

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[3]Harlow, William M. and Harrar, Ellwood S., Textbook of Dendrology, Fifth Edition, McGraw-Hill, 1968.

resistance to drought. This species attains its greatest development, however, on the relatively moist but well-drained western slopes of the Siskiyou and Sierra Nevada Mountains of southern Oregon and California, respectively.

Ponderosa pine occurs in pure and mixed coniferous stands. Excellent pure forests are found in the Black Hills of South Dakota, the Blue Mountains of Oregon, the Columbian Plateau northeast of the Sierra Nevada, and in northern Arizona and New Mexico. It is also commonly the most abundant tree in mixed coniferous stands; east of the summit of the Cascade Range in Washington and Oregon it occurs with western larch, Douglas-fir, and occasionally lodgepole pine; in the central Rocky Mountains with Douglas-fir; and in California with Jeffrey and sugar pines, incense-cedar, Douglas-fir, and white fir. On the Fort Lewis plains in western Washington, near Puget Sound, ponderosa pine is occasionally found in association with Douglas-fir and Oregon white oak.

Small quantities of seed are produced annually, but large crops are released only at intervals of three to five years. Under forest conditions germination as high as 50 percent may be anticipated, but in the nursery this figure can be increased to 80 percent. Seedlings can exist under the canopy of the parent trees, even though they grow quite slowly, and in such conditions often attain a height of only 3 to 4 ft during the first 15 to 20 years. Reproduction is best in clearings made by fire or logging. The seedlings will grow on sterile sites and have been planted extensively in the Nebraska sand hills and elsewhere. Ponderosa pine is classed as intolerant.

The rapidity of growth has a marked effect on the general appearance of the trees of this species. Young, vigorous specimens commonly develop dense crowns of dark foliage, and bark which is dark brown to nearly black, more or less corky, and deeply furrowed. In contrast, the foliage of old-growth or slow-growing trees is yellow-green, and the bark yellow-brown to cinnamon-red and plated. Those of the first type are generally called "bull" or "blackjack pines," and to some woodsmen ponderosa pine and bull pine are different trees. Fast-growth bull pines 150 years of age found near Cle Elum, Washington, measured 30 to 40 in. in diameter, while more typical ponderosa pines occurring in the same vicinity were only 10 to 14 inches in diameter at the same age. The growth of this species varies considerably with locality. In California, trees 120 years of age averaged 23 in. d.b.h., while in Arizona trees of the same age were only 16 in., and in the black hills 10½ in. Trees over 500 years of age are seldom encountered (Keen considers that this pine may reach an age of 800 years, while Mills reported a tree in southwestern Colorado with 1047 rings.). Severe damage is caused by bark

beetles, and ponderosa pine is also attacked by more than 100 other kinds of insects. Fires kill seedlings and cause considerable damage even to large trees. Severe fires in the past have completely destroyed hundreds of thousands of acres of ponderosa pine forest. Other destructive agents include mistletoe and fungi.

The common name ponderosa pine is identical with the species name. Previously called western yellow pine, logs of this tree were also sold under such names as Arizona white pine, California white pine, and western soft pine, since the wood resembles that of the white pines rather than that of the hard, moderately heavy wood of the southern yellow pines. Finally, the name ponderosa pine was adopted by the U. S. Forest Service, and it is now accepted by the industry.

RANGE

Western North America. Altitudinal distribution: 5,000 to 8,000 ft in Arizona, 3,300 to 6,000 ft in Montana and South Dakota, 2,000 to 7,000 ft in northern Idaho, sea level to 6,200 ft in British Columbia and Washington, sea level (Columbia River Valley) to 7,000 ft in Oregon, 300 to 7,000 ft in northern California, 4,000 to 9,000 ft in southern California; for the most part a tree of relatively low elevations.

DOUGLAS-FIR (Pseudotsuga menziesii (Mirb.) Franco[4]

BOTANICAL FEATURES

Leaves ¾" to 1¼" long, yellow-green or blue-green, more or less flattened, standing out from all sides of the twig or with a tendency to be somewhat 2-ranked; apex rounded-obtuse or rarely acute, stomatiferous below, persistent for 8 or more years.
Cones 3" to 4" long, pendent, ovoid-cylindric, with exserted, 3-lobed, forklike, appressed or strongly reflexed bracts; seeds triangular, terminally winged; about 42,000 seeds to the pound, dewinged.
Buds fusiform, sharp-pointed, lustrous brown.
Bark on young stems smooth except for resin blisters; at length becoming 6" to 24" thick on old trees, and then divided into thick reddish-brown ridges separated by deep irregular fissures.

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[4]Harlow, William M. and Harrar, Ellwood S. Textbook of Dendrology, Fifth Edition, McGraw-Hill, 1968.

In a few instances the bark is "tight" (fine-textured) on old trees and corky on others, particularly those of the mountain form.

GENERAL DESCRIPTION

Douglas-fir, monarch of Pacific Northwest forests, was first observed by Menzies on Vancouver Island when he accompanied the British naval captain Vancouver on an expedition to the Pacific Coast in the early 1790s. For more than a quarter of a century this tree was variously classified as a spruce, hemlock, true fir, and even as a pine; in fact logs exported by the Hudson's Bay outpost near the mouth of the Columbia River were listed in European ports as "Oregon pine," a name which has persisted in the trade to this day, especially in Australia. It remained for David Douglas, a Scottish botanist sent out by the Royal Horticultural Society in 1825, to study this tree, to show that it was sufficiently different to be considered as separate from other previously described conifers; later Carrière coined the new generic name Pseudotsuga. This name was a rather unfortunate choice, since it literally means "false hemlock." The common name, Douglas-fir (The names red fir and yellow fir have been used by loggers and lumbermen to differentiate locally certain specimens on the basis of ring width, color and softness.), commemorates Douglas, and in addition serves to distinguish this species from the true fir (Abies).

Douglas-fir is a dimorphic species with two more or less distinct forms (Several European workers have claimed that there are three species of Douglas-fir; this is based largely upon needle structure. Studies by W. E. Kilgore at the New York State College of Forestry have failed to substantiate this viewpoint.). One of these is restricted to the forests of the Pacific slope, and the other to those of the Rocky Mountain region.

The Rocky Mountain form of Douglas-fir is considered distinct from the coast form by some taxonomists, who accordingly classify it as Pseudotsuga glauca Mayr. or Pseudotsuga menziesii var. glauca (Beissn.) Franco. However, in certain sections, the two types intergrade. Usually the foliage of the Rocky Mountain tree is blue-green, but sometimes trees with blue-green foliage and others with yellow-green leaves are found standing together. Similarly, although yellow-green crowns are typical of the coast form, some trees show a blue-green coloration. The principal botanical difference between these two forms lies in the structure of their cones. Rocky Mountain trees have small cones rarely 3 inches in length, with much-exserted and strongly reflexed

bracts. By contrast, the cones of the coast form are often 4 in. long and have straight, more or less appressed bracts.

Douglas-fir comprises about 50 percent of the standing timber of our western forests. It produces more timber than any other American species and at the present time furnishes about one-fifth of the total annual cut.

ROCKY MOUNTAIN FORM

The Rocky Mountain form of Douglas-fir rarely exceeds a height of more than 130 ft or a diameter of 3 ft. It occurs in both pure and mixed stands with ponderosa pine, western larch, and grand fir. Other associates include western hemlock, western white and lodgepole pines, Engelmann spruce, white fir and aspen. Douglas-fir is more tolerant than these except the hemlock and spruce.

Although most abundant on moist sites, Rocky Mountain Douglas-fir is quite drought resistant and is often found on arid areas with ponderosa pine. It is frost-resistant and hardy in the East and is a common ornamental of that region. The trees are grown for timber in Europe and have been planted successfully in many parts of the world.

RANGE

Western United States and British Columbia. Altitudinal distribution: sea level to 5,000 ft along the coast; 4,000 to 6,000 ft inland; 10,000 ft in the southern Rocky Mountains.

DWARF-MISTLETOE[5]

Quick Facts

Dwarf mistletoe causes a serious forest problem in many parts of Colorado.
Hosts for mistletoe include most members of the pine family.
The seeds of mistletoe are dispersed in August and early September.
The ultimate effect of dwarf mistletoe is premature death of the affected tree.

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[5]Swift, C. E. and Dickens, L. E. Dwarf-Mistletoe, Colorado State University Extension Service, Service in Action Leaflet No. 2.925.

Dwarf mistletoes (Arceuthobium spp.) are a major problem in Colorado forests on ponderosa and lodgepole pine. Other members of the pine family, Douglas-fir, pinyon and limber pine are damaged occasionally. Nursery and ornamental plantings seldom are attacked; however, this parasite can be introduced into an area by the planting of collected stock infected with dwarf mistletoe.

Dwarf mistletoes are small, leafless, parasitic flowering plants. The seeds, explosively discharged from the fruit, are very sticky and adhere to any surface they strike. Seeds that adhere to young branches of susceptible trees germinate and the mistletoe plant penetrates the bark. These seeds generally are dispersed is August and September.

This parasite is easily identified by the yellow to green or brownish-green segmented shoots that protrude from the infected part of the tree. These perennial shoots are 2 to 6 inches (5-15 centimeters) long and ⅛- to ¼-inch (.3-.6-cm) in diameter.

The "roots" of the dwarf mistletoe are imbedded in the bark and phloem of the tree. The parasite produces secondary root-like structures called "sinkers" that become imbedded deeper in the wood as the twig adds its annual growth rings. These "roots" provide the parasite with nutrients obtained from the living tissues of its host.

Symptoms

The first symptom of dwarf mistletoe infection is a slight swelling of the bark at the site of infection. As the "roots" of the parasite become more extensive in the host, a distorted branching habit or witches' broom may form. The witches' broom diverts food from uninfected parts of the tree, subsequently reducing vigor and causing premature death of the tree. Infected trees that do not develop witches' brooms usually have visible mistletoe shoots protruding from the infected area; however, shoots are not formed until two to three years after infection.

Control

Pruning is the best control measure available for reducing or eliminating dwarf mistletoe infections in ornamental trees or urban forests. Trees severely infected in the upper branches or those with only a few live branches should be cut. Trees with high, unreachable mistletoe infections will continue to rain seeds on nearby trees if not cut down.

Lightly infected trees can be freed from the parasite by pruning off all infected branches. All branches to be pruned should be cut off flush with the trunk. The entire branch should be removed. The trees should be examined every two or three years and any infected branches pruned off. The mistletoe shoots die as soon as the branch is cut, consequently burning pruned-off branches is not necessary.

If the mistletoe on a branch is close to the trunk the infection may have already entered the trunk. Shoots will form on the trunk even if the branch is removed. When pruning infected limbs, the following guidelines should be used to insure the trunk is free from infection. Trees with infections closer than indicated should be cut down to remove a future source of infection.

Branch diameter (outside bark)	Distance of infection on branch from trunk
Under 1.0 inch (2.5 centimeters)	6 inches (15.2 cm)
1.1 - 2.0 inches (2.8 - 5.1 cm)	8 inches (20.3 cm)
2.1 - 3.0 inches (5.3 - 7.6 cm)	10 inches (25.4 cm)
3.1 - 4.0 inches (7.9 - 10.2 cm)	12 inches (30.5 cm)

In some cases a highly desirable tree with a trunk infection cannot be removed for aesthetic or other reasons. In these instances, the mistletoe shoots must be knocked off periodically as they appear to prevent further spread.

In heavily infested areas, nonsusceptible trees can be planted to replace cut trees. Ponderosa pine areas can be planted to:

Douglas-fir	Pinyon pine	White fir
Limber pine (sic)	Blue spruce	Rocky Mountain juniper

In lodgepole pine areas, the following trees can be substituted:

Engelmann spruce	Subalpine fir	Douglas-fir

Hardwoods such as ash, birch and aspen, also can be planted in affected areas because dwarf mistletoes do not attack hardwood trees.

DWARF-MISTLETOE ADDENDUM

Three species of dwarf-mistletoe occur in Boulder County. They are ponderosa pine dwarf-mistletoe (Arceuthobium vaginatum), lodgepole pine dwarf-mistletoe (Arceuthobium americanum) and limber pine dwarf-mistletoe (Arceuthobium cyanocarpum), each named for its primary host.

Besides its primary host, each dwarf-mistletoe species attacks the other two pine species as a secondary host (Limber pine is attacked by ponderosa pine dwarf-mistletoe as a secondary host and should not have been listed on the Service in Action leaflet as suitable for planting on ponderosa pine sites.). Only in rare circumstances are other species of trees affected.

Dwarf-mistletoe infects and eventually kills its primary host. Secondary hosts are much more resistant to attack. There are numerous examples of secondary host trees standing in the middle of heavy dwarf-mistletoe infections without becoming infected.

Dwarf-mistletoe control is achieved in forest situations by clear-cutting the infected patch, allowing the stand to regenerate from natural seeds from adjacent stands. If the patch is a large one, the clearcut may have to be completed in several stages so that a seed source remain nearby until the stand regenerates.

In urban settings, or with ponderosa pine dwarf-mistletoe, which is large enough to see easily, it is often feasible to prune dwarf-mistletoe out of infected trees. Due to dwarf-mistletoe's incipient stage, this process must be repeated for at least three consecutive years.

Planting with susceptible tree species before the overstory stand is free of dwarf-mistletoe will result in reinfection. Seedlings are small and not usually infected during the first few years, so if control efforts are continued until all dwarf-mistletoe is gone, an extra two or three years' growth can be obtained by planting after the first year's cleaning.

ADDITIONAL READING

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