

STEWARDSHIP INCENTIVES PLAN

for

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833-2150

Part of
S1/2 SE1/4, Sec 8, T2N, R67W, S.P.M.

(75.1 Acres)

Prepared By:

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Colorado State Forest Service
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December 12, 1995

This management plan has been prepared at my request to guide my Stewardship management activities which I voluntarily apply on my property. I believe that activities recommended in this plan are appropriate to meet my objectives and will benefit the natural resources on my property. I intend to apply the recommended practices and to maintain them for a period of at least ten years, thus helping me to be a good steward of the forest and associated resources entrusted to me on my property.

Craig Owen

Date

356-8097
Weld CFSA

STEWARDSHIP INCENTIVES PLAN

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OBJECTIVE

To provide wind protection to a new house and to the north and west sides of the property. Also, to provide a visual barrier along the county roads.

DESCRIPTION

The property is located in Weld County on the northwest corner of Weld County Road 15½ and Weld County Road 22.

The property contains 75.1 acres. It was formerly a field used for row crops, now being converted to residential use. Most of the property will continue to be used for agriculture, mostly for the growing of alfalfa. The new house is located just west of the geographic center of the property.

An irrigation canal cuts across the northeast corner of the property.

Annual precipitation is about 15 inches.

Bedrock is a Cretaceous Age deposit of Pierre shale, 10,000 feet thick.

The soil immediately north and west of the house site is Valent sand, an eolian (wind) deposit with a layer of lime at a depth of 40 inches. The rest of the property is Vona loamy sand, also eolian. These soils do not hold staples well and weed barrier needs to be carefully anchored. If disturbed, the soil tends to blow away. Weed barrier, anchored by covering with soil frequently pulls loose and blows away. The porous nature of these soils allows water to drain rapidly, making the use of weed barrier and/or supplemental watering desirable.

INVENTORY

Currently, the only woody vegetation consists entirely of a planting of ash and honey-locust along the south and east sides of the property.

WILDLIFE

There is an opportunity to provide nesting sites for mourning doves by planting a pine thicket in the northeast corner of the

property, adjacent to the irrigation ditch. Any vertically-oriented vegetation would provide needed cover and nesting sites.

No threatened or endangered species have been observed, but the property is within the winter range of the bald eagle and in an area used by the interior least tern; although, no self-respecting tern would do anything more than fly over it.

PLANTING PROJECTS

North Line (Planting L):

Purpose: A field windbreak to trap snow to supply extra water to the alfalfa and reduce air movement, reducing evaporation.

Description: This is a three-row planting along the property line. It is 2084 feet long and 36 feet wide, including 10-foot buffer strips on each side. It occupies 1.7 acres. The outer (northern) row consists of 521 American plums on a four-foot spacing, located four feet from the fence. The middle row consists of 347 Rocky Mountain junipers on a six-foot spacing located 8 feet from the plume, while the inner (southern) row consists of 260 ponderosa pines on an 8-foot spacing located 8 feet from the junipers.

Costs for this planting are estimated below:

521 American plums @ \$0.41 ea.:	\$ 213.61
347 Rocky Mountain junipers @ \$0.94 ea.:	326.18
<u>260 Ponderosa pines @ \$0.94 ea.:</u>	<u>244.40</u>
1128 Seedlings:	\$ 814.98
Bulk Rate Discount (10%):	<u>81.50</u>
Total, Trees:	\$ 733.48
7000 Staples @ \$0.065 ea.:	455.00
23 6' rolls Weed Barrier @ \$100.00/roll:	<u>2300.00</u>
SUB-TOTAL	\$3488.48
Sales Tax (3%):	<u>104.65</u>
TOTAL, MATERIALS:	\$3593.13

You can plant this windbreak yourself for the costs shown above. Should you wish to hire CSFS to plant it, labor charges would work out as follows:

LABOR, PLANTING; 1128 trees @ \$1.50 ea.:	\$1692.50
LABOR, WEED BARRIER; 23 rolls @ \$100 ea.:	<u>2300.00</u>
LABOR:	\$3992.50

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This practice is eligible for up to \$1700 in SIP cost-share money. CSFS will apply a credit to the labor charge if you wish to provide people to work with us in doing the planting.

West Windbreak (Planting Q):

Purpose: To shelter the alfalfa field from west winds.

Description: This is a three-row like the one along the north property line. It is 1268 feet long and 36 feet wide, including 10-foot buffer strips on each side. It occupies 1.1 acres. The outer (western) row consists of 317 American plums on a four-foot spacing and is located four feet from the property line. The inner (second) row is located eight feet from the plum row and consists of 211 Rocky Mountain junipers on a six-foot spacing. The inside (eastern) row is eight feet east of the second row and consists of 158 ponderosa pines on an eight-foot spacing.

By planting the willows one foot from the ditch and at the edge of a weed barrier strip, rather than centered, one strip of weed barrier and its attendant costs can be eliminated.

317 American plums @ \$0.41 ea.:	\$ 129.97
211 Rocky Mountain junipers @ \$0.94 ea.:	198.34
<u>158 ponderosa pines @ \$0.94 ea.:</u>	<u>148.52</u>
686 Sub-total:	\$ 476.83
Bulk Discount (5%):	<u>23.84</u>
Seedlings:	\$ 452.99
4000 Staples @ \$0.065 ea.:	260.00
14 rolls Weed Barrier @ \$100.00/roll:	<u>1400.00</u>
Sub-total:	\$2112.99
Sales Tax (3%)	<u>63.39</u>
Total, Materials:	\$2176.38
LABOR, PLANTING; 686 trees @ \$1.50 ea.:	\$1029.00
LABOR, WEED BARRIER; 14 rolls @ \$100 ea.:	<u>1400.00</u>
LABOR:	\$2429.00

Again, you can save money on the labor charge by providing people to help.

This project can qualify for up to \$1100 in SIP cost-sharing.

Southwest Line (Planting S):

Purpose: To provide a visual barrier from the road.

Description: This is a three-row planting like the two above. Species are different from the adjoining windbreaks to prevent spread of disease through the plantings. It occupies 1.1 acres. It is 1363 feet long and 36 feet wide including buffer strips. It consists of a shrub (southern) row, such as cottoneaster, or Nanking cherry on a 4-foot spacing located four feet east north of the right-of-way. A caragana (middle) row on a six-foot spacing located eight feet north of the cherry row, and a row of eastern (Siouxland) cottonwoods or Siberian elms on an eight-foot spacing located eight feet north of the caraganas, make up the rest of the planting. Cottonwoods are fast-growing trees, but may need supplemental water for the first two or three years while they are getting established.

340 shrubs @ \$0.41 ea.:	\$ 139.40
227 Rocky Mountain junipers @ \$0.94 ea.:	213.38
<u>170 Siberian elm @ \$0.41 ea.:</u>	<u>69.70</u>
737 Total, Seedlings:	\$ 422.48
Bulk Rate Discount (5%):	<u>21.12</u>
Net, Seedlings:	\$ 401.36
4080 Staples @ \$0.065 ea.:	265.20
13.6 rolls 6' Weed Barrier @ \$100 ea.:	<u>1360.00</u>
Sub-Total:	\$2026.56
Sales Tax (3%):	<u>60.80</u>
Total, Materials:	\$2087.36
LABOR, Planting; 737 trees @ \$1.50 ea.:	\$1105.50
LABOR, Weed Barrier; 13.6 rolls:	<u>1360.00</u>
Total, Labor:	\$2465.50

This planting is cost-sharable as a hedge-row. It is eligible for up to \$245.

Farmstead Windbreak (Planting T):

Purpose: To protect the house and farmstead from wind.

Description: This planting occupies 0.8 acres; it is approximately 900 feet long by 36 feet wide. It too is a three-row planting. The tall row in this design is ponderosa pine, but if supplemental water is available, cottonwood, which grows faster, might be substituted for it. A drip system would be the most conservative with water and the easiest to use. Both ponderosa

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pinos and cottonwoods are resistant to high calcium and high pH.

Costs are estimated below:

225 American plums @ \$0.41 ea.:	\$ 92.25
150 Rocky Mountain junipers @ \$0.94 ea.:	141.00
<u>112 ponderosa pines @ \$0.92 ea.:</u>	<u>105.28</u>
487 Seedlings:	\$ 338.53
9 rolls 6' Weed Barrier @ \$100/roll:	\$ 900.00
2700 staples @ \$0.065 ea.:	<u>175.50</u>
Sub-Total:	\$1414.03
Sales Tax (3%):	<u>42.42</u>
Total, Materials:	\$1456.45

LABOR; Planting; 487 trees @ \$1.50 ea.:	\$ 730.50
LABOR; Weed Barrier; 9 rolls @ \$100 ea.:	<u>900.00</u>
Total, Labor:	\$1630.50

This planting is eligible for up to \$800 in cost-sharing support.

Northwest Plum Thicket (Planting U):

Purpose: To provide wildlife with escape cover to ameliorate the predator-lane effect of the windbreaks and to provide a food source for song birds.

Description: The planting contains about 0.1 acres. It is triangular and located in a right-angle corner where plantings L and Q meet. It is 93 feet on a side and 135 feet across the hypotenuse.

Costs are detailed below:

252 American plums @ \$0.41 ea.:	\$ 103.32
2.7 rolls weed barrier @ \$100 ea.:	\$ 270.00
1000 staples @ \$0.065 ea.:	<u>65.00</u>
Sub-Total, Seedlings and Materials:	\$ 438.32
Sales Tax (3%):	<u>13.15</u>
TOTAL, Seedlings and Materials:	\$ 451.47
LABOR; Planting; 252 trees @ \$1.50 ea.:	\$ 378.00
LABOR; Weed Barrier; 2.7 roll @ \$100 ea.:	<u>270.00</u>
TOTAL, Labor:	\$ 648.00

This planting is eligible for up to \$280 in cost-sharing money.

Northeast Pine Thicket (Planting V):

Purpose: To provide escape cover for wildlife to ameliorate the predator-lane effect of the windbreak, to provide cover for animals using the ditch for drinking water and to provide nesting sites near a water supply for mourning doves.

Description: This planting occupies 0.1 acres. It is triangular and located in a 101° corner. It is 94 feet on a side and 145 feet across the diagonal. It consists of 68 ponderosa pines (Ponderosa pine is used because of the open branching pattern preferred by doves as nesting sites.).

Costs are detailed below:

68 ponderosa pines @ \$0.94 ea.:	\$ 63.92
2.7 rolls weed barrier @ \$100.00 ea.:	\$ 270.00
1000 staples @ \$0.065 ea.:	<u>65.00</u>
TOTAL, Seedlings and Materials:	\$ 398.92
LABOR; Planting; 68 seedlings @ \$1.50 ea.:	\$ 102.00
LABOR; Weed barrier; 2.7 rolls @ \$100 ea.:	<u>270.00</u>
TOTAL, Labor:	\$ 372.00

This planting is eligible for up to \$280 in cost-sharing money.

FORESTER'S NOTE, PLANTING COSTS

Machine planting costs are half of hand-planting costs. Some money could be saved this way. Also, machine application of weed barrier is a lot cheaper than laying it by hand, but there are some trade-offs.

Once the site is disturbed by machines, sand soils won't hold a staple. Sand used to cover edges of machine-laid weed barrier just blows away, followed by the weed barrier. On sandy soils, machine-laid weed barrier needs to be covered with gravel (expensive) or heavy wood chips (free from Public Service; you have to lay them yourself). You could hire CSFS to supply the chips and lay them, but savings from using machines is eaten up by laying wood chips.

Also, with funding cut-backs, CSFS' tractor, planter and weed barrier machine have not been replaced as they wore out and maintenance needs have reached the critical level. These machines may not be available this coming year.

Hand-planting costs may not be quite as high as projected, either. If you hire CSFS to do the work, I will keep track of the hours worked and bill you at \$24 per hour, or \$1.50 per tree, whichever is less.

A possible compromise is to hire the planting done by machine (if available) and level the site by hand before laying weed barrier. This will bring planting costs to about \$1.00 per tree. Leveling is fairly simple: it takes a good hoe or McLeod and the site doesn't have to be all that level. You could probably do 1000 feet of row per day, by yourself.

One draw-back of machine planting is the irregular spacing of the trees: this creates gaps in the planting that have to be filled with trees the following year (Wind blows harder through the gap than it does on the open plain.). Also, while adequate, machines don't do as good a job as a conscientious hand planter and have higher mortality rates and poorer first- and second-year growth as a result. They do loosen the site up better and the survivors often have better growth during the third-to-fifth years. Sandy soils are already pretty loose, so the improved third-to-fifth-year growth is not as great as it is on heavier soils.

You can reduce or eliminate labor costs by doing the work yourself. You can also reduce CSFS' labor charges by working with us as a member of the crew (You need to be available on our schedule.).

The best combination in your case seems to be to hire trees planted by machine, level furrows by hand yourself and hire CSFS to lay weed barrier by hand. That way you will get a good job at a total labor cost of about \$2.50 per tree.

Visual Barrier (Planting X):

Purpose: To provide increased effectiveness of an existing planting and provide additional protection of the seedlings from weed competition and evaporation water losses.

Description: This planting totals 2063 feet long and is about 60 feet wide, including buffer strips. It occupies 2.9 acres in the southeast corner of the property. Existing rows should be interplanted with additional seedlings to shorten the time until the planting closes. Weed barrier should be laid on all seedlings, old and new.

The cost figures below are probably not real accurate because precise measurements and mortality estimates

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among existing trees were not made. I recommend that accurate measurements be taken and costs recalculated before any order is actually placed. Approximate costs are shown below:

386 shrubs @ \$0.41 ea.:	\$ 158.26
206 Rocky Mountain junipers @ \$0.94 ea.:	193.64
<u>386 Caraganas @ \$0.41 ea.:</u>	<u>158.26</u>
978 Seedlings:	\$ 510.16
Bulk-rate discount (5%):	<u>25.51</u>
Sub-total, seedlings:	\$ 484.65
21 rolls weed barrier @ \$100 ea.:	2100.00
100 6' weed barrier squares (pre-cut):	225.00
7200 staples @ \$0.065 ea.:	<u>468.00</u>
Sub-total, seedlings and materials:	\$3277.65
Sales Tax (3%):	<u>98.33</u>
Total, Seedlings:	\$3375.98
LABOR; Planting; 978 Seedlings @ \$1.50 ea.:	\$1467.00
LABOR; Weed Barrier; 21 rolls @ \$100 ea.:	2100.00
LABOR; Weed Barrier; 100 squares @ \$4.00 ea.:	<u>400.00</u>
Total, labor:	\$3967.00

This planting is eligible for 65% of cost up to \$2900 in SIP cost-sharing.

FORESTER'S COMMENTS

These plantings should probably be installed in bight-sized pieces over several years. If you do not use cost-sharing, there are no restrictions on which ones you do or in what order. If you use SIP cost-sharing, you must do the two wildlife thickets first (or at the same time as another planting). That way, you won't put yourself in danger of breaking any rules of the if-you-do-A-you-must-do-B variety. After that, you can install whichever plantings you like in whatever order you like and still be eligible for cost-sharing on all of them.

CSFS usually over-plans planting projects; this plan is no exception. This is partly because we are true believers where trees are concerned and partly so that anything you might want to do is already planned and you won't have to lose cost-sharing or other benefits because you aren't ready to take advantage of it when the opportunity arises.

These plantings collectively total 4336 trees. This is a major project. Planting this many seedlings and laying this much weed barrier would keep two people busy for two full months. That is another reason to spread the work over several years.

MAINTENANCE

The use of weed barrier just about eliminates the need for maintenance if it can be placed by mid-June (preferably June 1st). The only thing needed is an occasional inspection tour to re-anchor weed barrier that comes loose. Watering will increase survival and growth, but it is not needed in most plantings.

You can expect about 15% loss during the first year a planting is in the ground. One year after planting, surviving seedlings usually look terrible, but recover quickly. Shrub thickets can tolerate about 30% loss without replanting, but windbreaks must be replanted if they suffer even minor losses to keep from losing their effectiveness. By the third year, transplant losses should no longer be a problem. A seedling is considered established after surviving five years.

Gaps in a windbreak are disastrous - wind blows harder through the gap than it does on the open plain. Gaps wider than 1.5 times the specified spacing should be filled with trees at the next maintenance planting.

There are a number of things that should be done to enhance seedling survival and growth: Grass is a vigorous competitor with tree seedlings. It drinks up water and adds compounds to soil to poison competition. Seedlings grow much better if they don't have to fight it. Weed barrier is a woven plastic cloth. It kills grass. Laid around tree seedlings, it provides needed relief from competition. It is expensive (\$2.00 per tree for widely-spaced trees). It is cheaper if seedlings are placed close together (like plums).

CSFS will be glad to help with maintenance if you ask, but it is your responsibility. The above price estimates do not include things like re-anchoring weed barrier after a storm, or watering seedlings should drought threaten the planting during the first summer (Although, this can be arranged.).

The plantings are designed as a "mix-and-match" group. No one planting is critical to the effectiveness of any other. Thus, you are able to pick and choose in any combination without loss to other plantings.

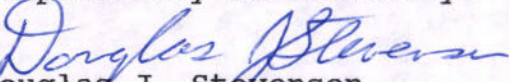
There are some things, like bulk-purchasing, that can be done to reduce cost. Also, by doing some of the work yourself and using CSFS only for planting and weed barrier, costs can be further reduced.

Yes, this is expensive; but I have noticed that people whose plantings fail because they took short-cuts to save money, forget all about the savings as soon as the tree dies and blame the

nursery or the contractor (anybody but themselves) for its failure. Nobody counts the cost when they look at a planting that has been in the ground twenty years; they're just glad they planted it.

With these plantings you can have a beautiful and functional home and landscape. I hope CSFS can be a part of your program.

Respectfully Submitted By:


Douglas J. Stevenson
Assistant District Forester

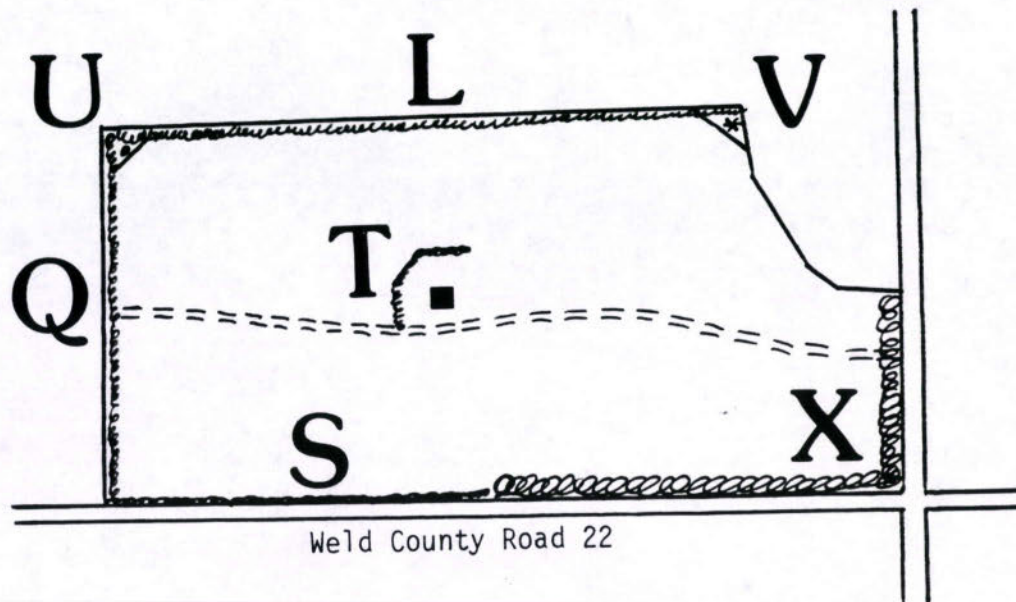
Craig Owen



660 Feet



10 Chains



Weld County Road 22

- Property Line
- == Road, Improved
- === Road, Unimproved
- ~~~~ Windbreak (Planned; L, Q, S, T)
- ~~~~~ Windbreak (Existing; X)
- △ Pine Thicket (V)
- △ Shrub Thicket (U)
- House

Drawn By: *Douglas J. Stevenson*

December 10, 1995

PLAINS COTTONWOOD (Populus deltoides var. occidentalis Rydb.)

William M. Harlow, Ph.D., SUNY College of Forestry
Ellwood S. Harrar, Ph.D., Duke School of Forestry

Textbook of Dendrology

BOTANICAL FEATURES

Leaves 3" to 6" long, 4" to 5" wide; shape deltoid to ovate-deltoid; margin crenate-serrate, the teeth glandular; apex acuminate to acute; base truncate to cordate; surfaces lustrous green, glabrous above, somewhat paler and glabrous below; petiole flattened, 1½" to 3" long, glandular.

Fruit ¼" to ⅓" long, ovoid, 3- or 4-valved; seeds about 350,000 (200,000-590,000) to the pound.

Twigs stout, angular, yellowish brown, glabrous; terminal buds about ⅜" long, narrowly ellipsoidal to conical, lustrous brown, resinous, covered by 6 or 7 imbricated scales; lateral buds somewhat smaller, divergent.

Bark light greenish yellow on young stems, eventually becoming ash-gray and dividing into thick, flattened or rounded ridges separated by deep fissures.

GENERAL DESCRIPTION

This species, the most important of the eastern poplars, is a medium-sized to large tree 80 to 100 ft high and 3 to 4 ft in diameter (max. 175 by 12 ft). Open-grown trees have a spreading crown supported by a massive trunk which is often divided near the ground and terminates below in an extensive superficial root system; in the forest, the bole is long, clear, and cylindrical, and the crown much smaller.

Not common in the Northeast and Appalachian regions, eastern cottonwood, together with its varieties or closely related species, covers a wide range from the Rocky Mountains to the southern Atlantic Coast. It is especially common on moist alluvial soils through the plains and prairie states, where a winding belt of green cottonwood crowns usually indicates the presence of a stream or water course. Although not found naturally on dry soils, this species was planted extensively around homesteads by the early settlers and when once established has proved to be relatively drought resistant.

On the best alluvial soils in the Mississippi Valley growth is exceedingly fast, and young trees commonly grow 5 ft or more in

height and 1 in. in diameter yearly. Cottonwood is very intolerant and occurs in pure stands or open mixtures with such species as black willow, sycamore, American elm, and some of the bottom-land oaks. In the South, cottonwood may seed in on old fields in mixture with sweetgum, by which it is eventually replaced.

Like other poplars, eastern cottonwood liberates large quantities of silky-haired seeds which may travel by air or on the surface of water for many miles. Although germination is high (60 to 90 percent), vitality is transient, and this probably accounts for the distribution of the species along water courses where in late spring moist silt is available for the sprouting seeds. Propagation by cuttings is good, and young trees produced in this way make rapid growth; two-year-old trees sometimes attain heights of 30 ft and diameters of nearly 5 in. Cottonwood is a short-lived species; trees over 70 years old rapidly deteriorate, and the maximum life span is probably not greater than two centuries.

RANGE

Plains cottonwood: the Great Plains.

PONDEROSA PINE (Pinus ponderosa Laws.)¹

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 $\frac{1}{4}$ " 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.

¹Harlow, William M. and Harrar, Ellwood S., Textbook of Dendrology, Fifth Edition, McGraw-Hill, 1968.

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 tap-roots 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 is indicative of its great 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.

Valent Soil Series²

The Valent series consists of deep, excessively drained soils that formed in eolian deposits. Valent soils are on plains. Slopes are 0 to 9 percent.

Valent soils are near the Loup, Boel, Osgood, and Vona soils. Loup and Boel soils are poorly drained. Osgood and Vona soils have a B horizon.

Typical pedon of Valent sand, 0 to 3 percent slopes, 2,220 feet north and 132 feet west of southeast corner sec. 8, T. 4 N., R. 62 W.

A1 - 0 to 8 inches; brown (10YR 5/3) sand, dark grayish brown (10YR 4/2) moist; single grained; loose; neutral; clear smooth boundary.

C1 - 8 to 60 inches; brown (10YR 5/3) sand, dark grayish brown (10YR 4/2) moist; single grained; loose; neutral.

Coarse fragments make up 0 to 10 percent of the solum and are mainly scattered gravel. Depth to free carbonates is more than 40 inches.

The A horizon has a hue of 10YR and 2.5Y, value of 5 or 6 dry and 3 to 5 moist, and chroma of 2 or 3.

Valent Sand. This is a deep, excessively drained soil on plains at elevations of 4,650 to 5,100 feet. It formed in eolian deposits. Included in mapping are small areas of soils that have lime within a depth of 40 inches. Also included are small areas of soils that have sandstone between 40 and 60 inches.

Typically the surface layer of the Valent soil is brown sand about 6 inches thick. The underlying material to a depth of 60 inches is brown sand.

Permiability is rapid. Available water capacity is moderate. The effective rooting depth is 60 inches or more. Surface runoff is slow, and the erosion hazard is low.

The potential vegetation is dominated by sand bluestem, sand reedgrass, switchgrass, sideoats grama, needleandthread, little bluestem, and blue grama. Potential production ranges from 2,500 pounds per acre in favorable years to 1,800 pounds in unfavorable

²Crabb, James A., et al.; Soil Survey of Weld County, Colorado, Southern Part, USDA - Soil Conservation Service, Denver, 1980.

years. As range condition deteriorates, the sand bluestem, switchgrass, sand reedgrass, sideoats grama, and little bluestem decrease, forage production drops, and sand sage increases. Undesireable weeds and annuals invade and "blowout" conditions can occur as range condition becomes poorer.

Vona Soil Series³

The Vona series consists of deep, well drained to somewhat excessively drained soils that formed in eolian or alluvial deposits. Vona soils are on plains and high terraces. Slopes are 0 to 9 percent.

Vona soils are similar to the Olney and Terry soils and are near the Ascalon, Bresser, Julesburg, Osgood, Otero, and Valent soils. Olney, Ascalon, and Bresser soils are more than 18 percent clay in the B2t horizon. Terry soils have sandstone between 20 and 40 inches. Julesburg soils have a dark colored surface layer. Osgood soils have an A horizon that is coarser than loamy fine sand and is more than 20 inches thick. Otero and Valent soils lack a B horizon.

Typical pedon of Vona loamy sand, 0 to 3 percent slopes, 180 feet north and 1,400 feet east of southwest corner sec. 25, T. 5 N., R. 61 W.

A1 - 0 to 6 inches; grayish brown (10YR 5/2) loamy sand, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable; neutral; clear smooth boundary.

Vona loamy sand. This is a deep, somewhat excessively drained soil on plains and high terraces at elevations of 4,600 to 5,200 feet. It formed in eolian or alluvial deposits. Included ... are small areas of soils that have a loamy substratum and some areas of soils that are noncalcareous at a depth of 60 inches.

Typically the surface layer of this Vona soil is grayish brown. The upper 6 inches is loamy sand and the lower 6 inches is fine sandy loam. The subsoil is brown and light yellowish brown fine sandy loam about 16 inches thick. The substratum to a depth of 60 inches is sandy loam.

³Crabb, James A. et al.; Soil Survey of Weld County, Colorado, Southern Part, USDA - Soil Conservation Service, Denver, 1980.

Permeability is moderately rapid. Available water capacity is moderate. The effective rooting depth is 60 inches or more. Surface runoff is slow, and the erosion hazard is low.

In irrigated areas this soil is suited to the crops commonly grown in the area. Perennial grasses and alfalfa or close grown crops should be grown at least 50 percent of the time. Contour ditches and corrugations can be used in irrigating close grown crops and pasture. Furrows, contour furrows, and cross slope furrows are suitable for row crops. Sprinkler irrigation is also desirable. Keeping tillage to a minimum and utilizing crop residue help to control erosion. Maintaining fertility is important. Crops respond to applications of phosphorous and nitrogen.

In nonirrigated areas this soil is suited to winter wheat, barley, and sorghum. Most of the acreage is planted to winter wheat. The predicted average yield is 20 bushels per acre. The soil is summer fallowed in alternate years to allow moisture accumulation. Generally precipitation is too low for beneficial use of fertilizer.

Stubble mulch farming, stripcropping, and minimum tillage are needed to control soil blowing and water erosion. Terracing also may be needed to control water erosion.

The potential native vegetation on this range site is dominated by sand bluestem, sand reedgrass and blue grama. Needleand-thread, switchgrass, sideoats grama, and western wheatgrass are also prominent. Potential production ranges from 2,200 pounds per acre in favorable years to 1,800 pounds in unfavorable years. As range condition deteriorates, the sand bluestem, sand reedgrass and switchgrass decrease and blue grama, sand dropseed and sand sage increase. Annual weeds and grasses invade the site as range condition becomes poorer.

Management of vegetation on this soil should be based on taking half and leaving half of the total annual production. Seeding is desirable if the range is in poor condition. Sand bluestem, sand reedgrass, switchgrass, sideoats grama, blue grama, pubescent wheatgrass, and crested wheatgrass are suitable for seeding. The grass selected should meet the seasonal requirements of livestock. It should be drilled into a clean, firm sorghum stubble or a prepared seedbed. Seeding early in spring has proven most successful.

Windbreaks and environmental plantings are fairly well suited to this soil. Blowing sand and low available water capacity are the principle hazards in establishing trees and shrubs. The soil is so loose that trees should be planted in shallow furrows and vegetation maintained between the rows. Supplemental irrigation is needed to insure survival. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar,

ponderosa pine, and Siberian elm. The shrubs best suited are skunkbush sumac, lilac, and Siberian peashrub (caragana).

Wildlife is an important secondary use of this soil. The cropland areas provide favorable habitat for ring-necked pheasant and mourning dove. Many nongame species can be attracted by establishing areas for nesting and escape cover. For pheasants, undisturbed nesting cover is essential and should be included in plans for habitat development, especially in areas of intensive agriculture. Rangeland wildlife, for example, the proghorn antelope, can be attracted by developing livestock watering facilities, managing livestock grazing, and reseeding where needed.

This soil has good potential for urban and recreational development. Once established, the lawns, shrubs, and trees grow well. The chief limiting soil feature is the rapid permeability of the substratum, which causes a hazard of ground water contamination from sewage lagoons. In places recreational development is limited by the susceptibility to soil blowing. Capability subclass IIIe irrigated, IVe nonirrigated; Sandy Plains range site.

- A3 - 6 to 12 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak coarse subangular blocky structure; slightly hard, very friable; neutral; clear smooth boundary.
- B21t - 12 to 16 inches; brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable; few thin clay films on faces of peds; neutral; clear smooth boundary.
- B22t - 16 to 22 inches; yellowish brown (10YR 5/4) fine sandy loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to weak medium subangular blocky; hard, friable; few thin clay films on faces of peds; neutral; gradual smooth boundary.
- B3 - 22 to 28 inches; light yellowish brown (10 YR 6/4) fine sandy loam, yellowish brown (10YR 5/4) moist; weak coarse subangular blocky structure; slightly hard, very friable; calcareous; mildly alkaline; clear smooth boundary.
- Cca - 28 to 60 inches; light yellowish brown (10YR 6/4) sandy loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, very friable; some visible lime in fine filaments or threads; calcareous; moderately alkaline.

Thickness of the solum ranges from 18 to 37 inches. Coarse fragments make up 0 to 10 percent of the solum. Depth to free carbonates ranges from 12 to 24 inches.

The A horizon has value of 5 or 6 dry and 3 to 5 moist and chroma of 2 or 3. It is loamy sand or sandy loam. The B2t horizon is commonly fine sandy loam that is 10 to 18 percent clay. The C horizon ranges from coarse loamy sand to sandy loam.

Management of vegetation on this soil should be based on taking half and leaving half of the total annual production. Seeding is desirable if the range is in poor condition. Sand bluestem, sand reedgrass, indiangrass, switchgrass, sideoats grama, little bluestem and blue grama are suitable for seeding. Because this soil is susceptible to soil blowing, it should be seeded using an interseeder or the seed should be drilled into a firm, clean sorghum stubble. Seeding early in spring has proven most successful. Brush management can also help in improving deteriorated range.

Windbreaks and environmental plantings are generally not suited to this soil. Onsite investigation is needed to determine if plantings are feasible.

Wildlife is an important secondary use of this soil. Rangeland wildlife, for example, the pronghorn antelope, can be attracted by developing livestock watering facilities, managing livestock grazing, and reseeding where needed.

This soil has fair potential for urban development. The chief limiting soil features are the rapid permeability and the susceptibility to soil blowing. Septic tank absorption fields function properly, but in places the sandy substratum does not properly filter the leachate. Sewage lagoons must be sealed. Once established, lawns, shrubs, and trees grow well. Capability class VIe irrigated, VIe nonirrigated; Deep Sand range site.

Capability Unit VIIe-1 (Nonirrigated)

This unit consists of deep and moderately deep, well-drained soils of the Allens Park, Fern Cliff, Goldvale, and Piñata series. These soils have a stony coarse loamy sand, loamy sand, or gravelly sandy loam surface layer. The subsoil or underlying layer is gravelly sandy loam, sandy loam, gravelly sandy clay loam, sandy clay loam, or sandy clay. Slopes are 5 to 60 percent. Permeability is slow to moderately rapid, and the erosion hazard is high. Available water capacity is low to high. The effective rooting depth is 20 to 60 inches or more.

These soils are used mainly as woodland. They are also used as a habitat for wildlife. Proper management of both the timber and understory helps reduce possible erosion. Wooded areas should be

protected from fire and insects and from plant diseases. Thinning of timber improves the quality and quantity of trees.

A few areas of the woodland are used for grazing of the understorey vegetation. No more than half of the current year's growth of vegetation should be grazed. Where grazing is properly managed, such grasses as Arizona fescue, mountain muhly, and pine dropseed increase. Seeding of grasses is not practical because of the slope, rock outcrop, and the amount of trees and stones.