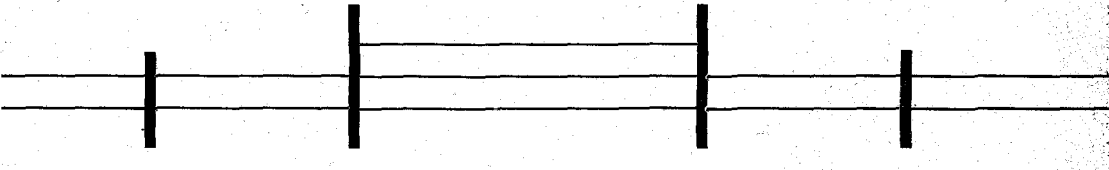
POLES *and* FENCE POSTS *for* OREGON FARMS



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Poles and Fence Posts for Oregon Farms

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INTRODUCTION

MILLIONS of wooden fence posts, corral poles, cane fruit stakes, and hop poles are in service on Oregon farms. Costs incurred in establishing and maintaining these essential farm improvements have increased sharply in recent years because of high labor charges plus the fact that the more desirable post and pole species are becoming less readily available in many areas of the state. This bulletin is designed to meet the demands of Oregon farmers for information pertaining to utilization and preservative treatment of native and introduced tree species for fence posts and poles.*

SPECIES OF WOOD USED

Tree species used for posts and poles are classified as either durable (red cedar, yew, juniper, redwood, black locust), or nondurable (pine, white fir, Douglasfir, cottonwood, alder, and others). Durable species generally give satisfactory service in contact with the ground, but the nondurable species require some preservative treatment before a comparable service period can be expected. The kind of post material that a farm operator will use depends on its availability, cost, and lasting qualities. The farmer's primary objective is to obtain fencing material at the lowest cost per year throughout the life of the farm operation.

In some localities steel or concrete posts are proving popular and have been less costly than wooden material when comparative service periods, availability, and labor are considered. Discarded railroad ties that have been treated make excellent posts and may often be purchased from railroad companies at low cost. Such material has been used to good advantage in several eastern Oregon counties.

PLANTATIONS FOR POST PRODUCTION

Some farm owners have established plantations of black locust, thus obtaining a continuous, dependable source of excellent fence

* Professor T. J. Starker, of the School of Forestry, Oregon State College, established an experimental post farm at the Oregon Forest Nursery in 1928. His bulletin, *Preservative Treatments of Fence Posts*, Bulletin No. 9, Engineering Experiment Station, together with subsequent progress reports, has been the principal source of information pertaining to fence post treating methods in Oregon. Some of the research results described in the bulletin have been incorporated in these pages.

post material. If the trees are planted in close spacing (8 feet by 8 feet) they will grow taller and straighter than trees spaced at greater distances. As the trees reach fence post size they should be cut so as to provide additional growing space for the smaller stems. Black locust posts, 4 to 6 inches in diameter, may be harvested from plantings in 8 to 10 years under optimum temperature, moisture, and soil conditions. Stumps of black locust sprout vigorously and will produce new posts from sprout growth if all sprouts except one are cut back after a year or two.

FACTORS AFFECTING DURABILITY IN AN UNTREATED POST

The lasting qualities of a wooden fence post depend on a number of factors, the most important of which are discussed in the following paragraphs.

1) Kinds of wood

Certain kinds of wood are naturally more durable than others in contact with the soil. Black locust and yew are considered the most durable fence post woods used in Oregon. Western red cedar, redwood, and western juniper are also excellent fence post species because of their natural durability.

2) Percentage of heartwood

Other things being equal, a post with a high percentage of heartwood will last longer than a post of the same species that is composed largely of sapwood. A large post will generally last longer than a small post because the former usually has more heartwood than the latter. (Figure 1.)

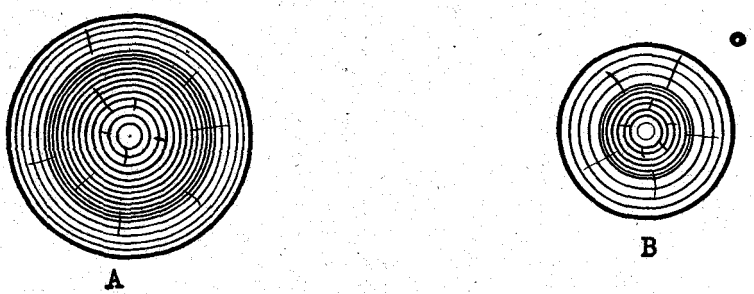

Figure 1. Post A has a greater percentage of heartwood than B, therefore is more desirable as a fence post.

3) **Soundness of wood**

Other things being equal, a post containing sound wood will last longer than one that contains defects or decay.

4) **Types of soil**

The type and moisture content of the soil is another important factor influencing the service life of fence posts, hop poles, and cane fruit stakes. For example, posts set in alkali soil usually last longer than posts of the same species in nonalkali soil. Posts that are constantly wet or constantly dry usually outlast posts of the same species that are set in alternately wet and dry situations.

5) **Amount and rate of seasoning**

Contrary to popular belief, there is little difference in length of service of posts that are dried and seasoned before setting and green posts of the same species that are set immediately after cutting. The time of cutting has been suggested as a factor influencing post life, but additional observation and experimentation are necessary before definite conclusions can be drawn. Posts cut in the fall usually dry out more slowly and check less than posts cut in the spring or summer. Too rapid seasoning in hot, dry weather will cause the post to check badly and thus expose the new wood to decay organisms. Posts cut in spring and early summer peel easier than posts cut in winter.

6) **Split or round posts**

There is considerable difference of opinion among farm operators as to whether split or round posts are the more durable. The fact is, one kind of post will last about as long as the other if there is the same amount of heartwood in both. If the percentage of heartwood is decreased by splitting, the split post will be less durable, but if the percentage of heartwood is increased by splitting the post will be more durable than a round post. Spruce, hemlock, or any of the true firs (white fir), are exceptions to this rule because their heartwood and sapwood are about equally durable.

7) **Charred posts and poles**

Charring is not recommended as a method of obtaining a longer service life from posts and poles. Tests show that charring actually shortens the life of a Douglasfir post several months below that of noncharred posts. (Figure 2.) This practice reduces the cross-sectional area of a post, thus removing part of the wood volume. Charring affects only the surface of the post, and when the post

checks after it is set in the ground the newly checked areas expose noncharred wood to attacks by decay organisms.

8) Method of setting post

Posts last longer if the soil is packed firmly around that part of the post below the ground. No advantage is gained by setting posts in concrete if moisture is allowed to collect at the point where wood and concrete are in contact. Rocks piled around the base of a post usually catch and hold additional moisture that increases the opportunity for decay organisms to attack the wood.

COMPARATIVE SERVICE LIFE OF UNTREATED POSTS

Many species of Oregon woods are not satisfactory as fence post material because of their relatively short life in contact with the soil. Figure 2 indicates the average life of some of the more common Oregon woods when used as untreated posts in contact with the soil.

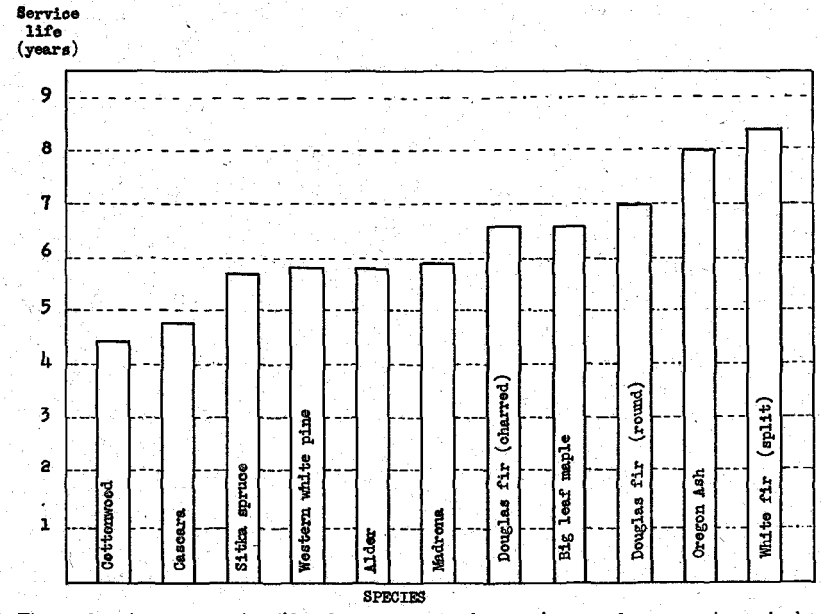

Figure 2. Average service life of some untreated posts in post farm experimental plot near Corvallis, Oregon. Posts averaged 6 inches in diameter.

SUGGESTIONS FOR CUTTING AND USING UNTREATED POSTS ON FARMS

1) Select trees that are sound.
2) Choose trees growing in thick stands.
3) Cut trees 10 inches or more in diameter because trees of this size generally have a higher percentage of durable heartwood than smaller trees in the same stand.
4) Cut stumps low for close utilization. Black locust will sprout from the stumps and produce new post material.
5) Remove bark to reduce attacks by insects.

PRESERVATIVE TREATMENTS FOR FENCE POSTS AND POLES

Recent high costs of the more durable fence posts have caused many farm operators to use less durable species. The service life of nondurable woods is relatively short and necessitates frequent replacement unless a preservative treatment is applied. Many treatments have been tried with varying degrees of success, but for purposes of this bulletin only those treatments that have proved to be effective, easy to apply, and relatively low in cost are included.

Preparing post for treatment

When green posts are to be treated with a preservative little preparation is necessary other than cutting and collecting the posts a few days prior to treating.

Certain preservative treating methods require that posts be seasoned before the preservative is applied. In such instances the following suggestions will aid in securing maximum effectiveness from the preservative.

1) The posts should be open piled so that the air will circulate freely around each one. The bottom of the pile should be raised at least one foot above the ground.
2) Green posts should be piled in shade or under cover during the hot, dry, summer months to prevent excessive checking and casehardening. If posts are cut in the fall or winter they should be piled under cover for protection against rain or snow.
3) Posts should be seasoned from 2 to 3 months prior to treatment.

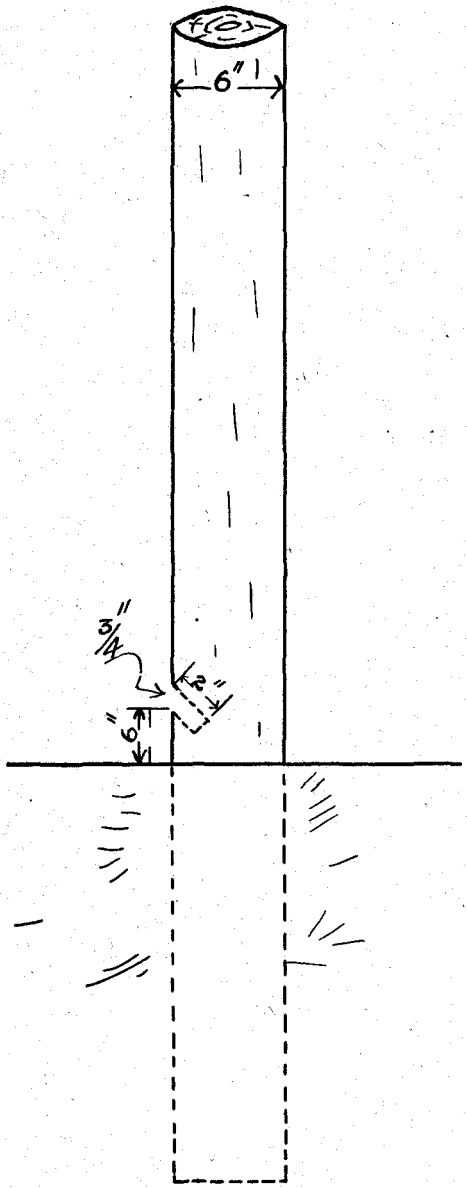

Figure 3. Diagram of post prepared for salt treatment method.

4) Painting the ends of posts will reduce checking during the seasoning period. Painted ends should be cut off prior to treating.
5) Bark should be removed to lessen attacks from insects.

SALT TREATMENT METHOD*

As the School of Forestry, Oregon State College, has experimented with the salt treatment method only since 1928, definite service periods can not yet be determined. The results obtained to date indicate that the method is effective, easy to apply, and low in cost. Douglasfir and lodge pole pine have been the only woods thus treated to date, but other softwood species can be effectively treated by this method.

Material

Freshly cut green material *must* be used. Success of the treatment depends on the amount of moisture in the post and that secured by absorption from the soil to dissolve the salts and distribute the

*Revised from original description by T. J. Starker, *Preservative Treatments of Fence Posts*, Engineering Experiment Station, Bulletin Series, No. 9, December 1938.

solution throughout the wood fibers. The bark should be left on that portion of the post below the ground. Round posts are preferred although the treatment may be applied to the sapwood side of a split post. Relatively little penetration into the heartwood will occur, however, and the split posts thus treated will probably last only as long as the natural life of the heartwood.

Formula

The formula used consists of equal parts by weight of corrosive sublimate, arsenic, and common salt. Three pounds of the mixture (1 pound of corrosive sublimate, 1 pound of arsenic, and 1 pound of salt) will treat 40 to 45 posts of 4 to 6 inches diameter. One tablespoon of the mixture is sufficient to treat one post of this size.

Application

A ¾ inch hole is bored in the post or pole approximately 6 inches above the ground line and slanting downward. The hole should be approximately 2 inches deep. One tablespoon of the mixture is inserted and the hole is either plugged with a cork, wooden plug, or ¾ inch dowel stock, or closed by nailing a small square of tin over the opening. *Particular care should be taken in closing this hole tightly to prevent stock from licking the poison.* Posts 7 to 9 inches in diameter require 2 holes (one on each side of the post). For posts 10 to 12 inches in diameter 3 equally spaced holes are suggested. A small funnel with an opening slightly less than ¾ inch is a handy aid when inserting the mixture in the post.

EXTREME CARE SHOULD BE TAKEN IN APPLYING THE SALT AND COVERING THE HOLE TIGHTLY; THE MIXTURE IS POISONOUS.

Cost

The cost for material approximates 6 cents per 4-inch post. This figure does not include labor for preparing or treating the posts. One man can treat between 12 and 15 four-inch posts per hour if all materials are prepared prior to treating. Commercial grades of the powder are less expensive than the refined grades. As a soluble form of arsenic is desirable, white arsenic is recommended.

Advantages of salt treatment

1) The method is inexpensive as to both material and equipment required. In many cases posts may be cut along the fence line thus saving distribution costs.
2) No time or labor is required in piling the fence post material for seasoning.

3) No training or experience is required in making the application.
4) Small material in the form of thinnings and otherwise unmerchantable saplings may be utilized.
5) A life of 18 years has been recorded for 4-inch Douglasfir posts treated by this method.

No instances have been recorded where stock have suffered ill effects by chewing on the treated posts. Apparently the salts do not dissolve out of the posts in sufficient amounts to poison water nearby. After the salts have dissolved and disappeared from the hole, there is little further danger to the stock if the plug falls out or is otherwise removed.

OPEN TANK CREOSOTE TREATMENT*

Material

Round, seasoned posts of any species that have been peeled of outer bark. Split posts may be used but treatment will be less effective.

Formula

Coal tar creosote and fuel oil, 50-50 mixture, or 50-50 mixture of coal tar creosote and crank case oil. Pure creosote may be used but oil should not be used alone.

Equipment

Two oil drums or metal tanks with one head removed from each drum or tank. Brick or rock foundation for fire box over which the drums are to be placed.

Application

Place the posts in one drum and fill both drums with the oil-creosote mixture to a point about a foot above the proposed ground line on the posts. The drum containing the posts should be filled to within 6 or 8 inches of the top. An equal quantity of the liquid should be placed in the other drum.

Build a fire under both drums and maintain a temperature of 180° to 200° F. for 3 to 4 hours in the drum containing the posts. The oil should not boil as it may spill over the sides of the drum and catch fire. The oil is very inflammable, thus close watch should be maintained.

Quickly transfer the posts into the second drum in which the oil-creosote mixture has been heated only to 100° F. and allow the

* Revised from original description by T. J. Starker, "Preservative Treatments of Fence Posts," Engineering Experiment Station, Bulletin Series, No. 9, December, 1938.

posts to remain 3 to 4 hours. The heat of the first bath drives the moisture and air from the posts and the lower temperature of the second bath draws the preservative into the wood cells. If only a few posts are to be treated the same results may be accomplished with one drum by pulling the fire from under the barrel and allowing the solution to cool slowly. A service life of 15 to 20 years may be expected from Douglasfir posts treated by this method.

If full length treatment is desired the posts may be reversed in the drum and the process repeated. In cases where a long tank is available the posts may be placed in a horizontal position, weighted down and treated full length in a single operation.

Two modified forms of the hot bath treatment are the dip and the cold soaking method. In these instances the posts are merely dipped or allowed to soak in the unheated creosote-oil mixture. Very little penetration is obtained by this method, but if the posts do not check a somewhat longer service life may be obtained over that of untreated posts.

Cost

The cost of materials for this method will approximate 10¢ per 4-inch post.

COLD SOAKING TREATMENTS

1. CHROMATED ZINC CHLORIDE

Material

Round, freshly cut, green cottonwood, poplar, or willow posts are particularly adapted to this method. The posts to be treated should be peeled. The treatment is recommended only for that portion of Oregon east of the Cascades that has less than 20 inches of rainfall. The solution leaches under moist conditions and is not recommended for posts that are to be set in wet sites.

Formula

One pound of granulated zinc chloride to one gallon of water makes a 10 per cent solution. Approximately one-half gallon of this mixture will treat one 4- to 6-inch post.

Equipment

A rectangular wooden trough or tank approximately 8 feet long, 2 feet deep, and 3 feet wide. Metal tanks are not satisfactory when zinc chloride is used because of its corrosive action.

Application

Place the posts in the wooden trough, weight them down so they will not float, and cover the posts with the zinc chloride solution. The posts should remain in the solution between 24 and 48 hours. On removal the posts should be piled or stacked so that the air may circulate freely around them. At least 4 weeks of seasoning is usually required before the posts may be set in the ground.

Cost

The cost of chromated zinc chloride approximates 10¢ per 4-inch post.

2. COPPER SULPHATE OR BLUESTONE

Material

Freshly cut, green, round posts that have been peeled should be used. Poplar, cottonwood, aspen, or willow are preferred although other species have been satisfactorily treated.

Formula

Two and one-half to three pounds of copper sulphate to each gallon of water. One-half gallon of the solution will treat one post 4 to 6 inches in diameter.

Equipment

A wooden barrel or tub. Metal barrels should not be used because of the corrosive action of copper sulphate.

Application

Stack the posts in an upright position in the barrel or tub and add solution at the rate of one-half gallon to each 4-inch or 6-inch post. When posts have soaked up the solution, remove them from the container and stack 4 weeks for seasoning.

Seasoned posts may be treated by cutting off a ½ inch piece from each end of the posts and soaking the top in the solution for approximately three hours. The posts are then reversed and the butts allowed to soak for at least 48 hours, whereupon they are ready to set in the ground.

Cost

Approximately 10¢ per 4- or 6-inch post.

OTHER TREATMENTS

There are other materials that may prove satisfactory for treating posts and poles. Relatively new treating processes have been developed in California and Idaho with pentachlorphenol applications, but as there are no adequate service records available for these treating methods to date, they are not included. These processes offer good possibilities for economical and easy methods of fence post preservation. Results of these and other methods will be reported as dependable data become available.

CALCULATING THE VOLUME OF POSTS AND POLES

Often times it is necessary to determine the cubic foot volume of a post or pole when estimating the amount of preservative required for a given number of pieces. The most practical way of determining the volume of posts and poles is to measure the diameter at both ends of the piece and figure the cubic foot volume from the following table.

Table for Calculating Cubic Foot Content of Posts and Poles

Diameter of large end—Inches	Diameter of small end—Inches											
	4	5	6	7	8	9	10	11	12	13	14	15
4	.087											
5	.111	.136										
6	.138	.165	.196									
7	.169	.198	.231	.267								
8	.204	.235	.269	.307	.349							
9	.242	.275	.311	.351	.395	.442						
10	.284	.318	.356	.398	.444	.493	.545					
11	.329	.365	.405	.449	.496	.547	.602	.660				
12	.378	.416	.458	.504	.553	.605	.662	.722	.785			
13	.431	.471	.515	.562	.613	.667	.725	.787	.853	.922		
14	.487	.529	.575	.624	.676	.733	.793	.856	.924	.994	1.069	
15	.547	.591	.638	.689	.744	.802	.864	.929	.998	1.071	1.147	1.227
16	.611	.656	.705	.758	.815	.875	.938	1.005	1.076	1.151	1.229	1.311
17	.678	.725	.776	.831	.889	.951	1.016	1.085	1.158	1.234	1.314	1.398
18	.749	.798	.851	.907	.967	1.031	1.098	1.169	1.244	1.322	1.404	1.489
19	.824	.875	.929	.987	1.049	1.114	1.184	1.256	1.333	1.413	1.496	1.584
20	.902	.955	1.011	1.071	1.134	1.202	1.273	1.347	1.425	1.507	1.593	1.682
21	.984	1.038	1.096	1.158	1.224	1.293	1.365	1.442	1.522	1.605	1.693	1.784
22	1.069	1.125	1.185	1.249	1.316	1.387	1.462	1.540	1.622	1.707	1.796	1.889
23	1.158	1.216	1.278	1.344	1.413	1.485	1.562	1.642	1.725	1.813	1.903	1.998
24	1.251	1.311	1.374	1.442	1.513	1.587	1.665	1.747	1.833	1.922	2.014	2.111
25	1.347	1.409	1.474	1.544	1.616	1.693	1.773	1.856	1,943	2.034	2.129	2.227

How to use the table

1) Find the average diameter at each end of the post or pole.
2) Find the number in the table corresponding to these two diameters.
3) Multiply this number by the length of the piece in feet. The result is the cubic foot content of the post or pole.

Example:

The average diameter of a pole is 6 inches at the small end and 7 inches at the large end. By following down the 6-inch column in the table under the heading "Diameter of Small End" until we come to the line marked "7 inches" under "Diameter of the Large End" we find the number to be .231. If the pole is 7 feet long multiply .231 by 7, which gives 1.617 cubic feet as the volume of a post or pole of this size.

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